Full SAP Calculation Printout

Property Reference	House Type F	Issued on Date	05/10/2023
Assessment Reference	Plot 1	Prop Type Ref	
Property			

SAP Rating	79 C	DER	5.52	TER	10.88
Environmental	96 A	% DER < TER			49.26
CO_2 Emissions (t/year)	0.33	DFEE	41.01	TFEE	45.83
Compliance Check	See BREL	% DFEE < TFEE			10.51
% DPER < TPER	0.09	DPER	58.09	TPER	58.15

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	66.0000	(1b)	x 2.4000	(2b) =	158.4000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.0000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	158.4000	(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	1 * 10 =	10.0000 (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) =	10.0000 / (5) =	0.0631 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2631 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2434 (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	0.3103	0.3042	0.2982	0.2677	0.2617	0.2312	0.2312	0.2251	0.2434	0.2617	0.2738	0.2860	(22b)
Effective ac	0.5482	0.5463	0.5444	0.5358	0.5342	0.5267	0.5267	0.5253	0.5296	0.5342	0.5375	0.5409	(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	
Opening Type 1 (Uw = 1.20)			17.6300	1.1450	20.1870			(27)
Heatloss Floor 1			66.0000	0.1200	7.9200	110.0000	7260.0000	(28a)
External Wall 1	81.6000	17.6300	63.9700	0.1900	12.1543	190.0000	12154.3000	(29a)
External Roof 1	66.0000		66.0000	0.1500	9.9000	9.0000	594.0000	(30)
Total net area of external elements Aum(A, m2)			213.6000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.1613			(33)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		20008.3000	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 303.1561 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	34.0000	0.0670	2.2780
E16 Corner (normal)	9.6000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	11.2600	0.0240	0.2702
E3 Sill	4.7000	0.0190	0.0893
E4 Jamb	25.2000	0.0140	0.3528
E10 Eaves (insulation at ceiling level)	26.0000	0.0460	1.1960
E12 Gable (insulation at ceiling level)	8.0000	0.0330	0.2640

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.4503 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.6117 (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	28.6530	28.5553	28.4595	28.0095	27.9253	27.5334	27.5334	27.4608	27.6843	27.9253	28.0956	28.2737	(38)
Heat transfer coeff	83.2647	83.1670	83.0711	82.6212	82.5370	82.1450	82.1450	82.0725	82.2960	82.5370	82.7073	82.8853	(39)

Average = Sum(39)m / 12 = 82.6208

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2616	1.2601	1.2587	1.2518	1.2506	1.2446	1.2446	1.2435	1.2469	1.2506	1.2531	1.2558	(40)
HLP (average)												1.2518	
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 2.1452 (42)

Hot water usage for mixer showers

60.1883	59.2838	57.9658	55.4439	53.5828	51.5074	50.3277	51.6358	53.0697	55.2981	57.8741	59.9577	(42a)

Hot water usage for baths

26.0062	25.6199	25.0761	24.0732	23.3223	22.4897	22.0399	22.5800	23.1681	24.0590	25.0825	25.9183	(42b)

Hot water usage for other uses

36.5995	35.2686	33.9377	32.6068	31.2759	29.9450	29.9450	31.2759	32.6068	33.9377	35.2686	36.5995	(42c)

Average daily hot water use (litres/day) 112.8757 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.7940	120.1723	116.9795	112.1239	108.1810	103.9421	102.3126	105.4917	108.8445	113.2948	118.2252	122.4754	(44)
Energy conte	194.4756	171.1238	179.7931	153.4920	145.6325	127.8089	123.7383	130.6207	134.2162	153.7399	168.4334	191.7669	(45)

Energy content (annual) Total = Sum(45)m = 1874.8415

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

29.1713	25.6686	26.9690	23.0238	21.8449	19.1713	18.5607	19.5931	20.1324	23.0610	25.2650	28.7650	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9720 (55)

Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

247.8700	219.3510	233.1875	205.1640	199.0269	179.4809	177.1327	184.0151	185.8882	207.1343	220.1054	245.1613	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

247.8700	219.3510	233.1875	205.1640	199.0269	179.4809	177.1327	184.0151	185.8882	207.1343	220.1054	245.1613	(64)

Total per year (kWh/year) = Sum(64)m = 2503.5175 (64)

12Total per year (kWh/year) 2504 (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

107.3787	95.4804	102.4967	92.3737	91.1383	83.8341	83.8585	86.1469	85.9645	93.8340	97.3417	106.4780	(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	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.7172	104.8655	94.7172	97.8745	94.7172	97.8745	94.7172	94.7172	97.8745	94.7172	97.8745	94.7172	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.7875	189.7362	184.8256	174.3717	161.1755	148.7729	140.4872	138.5386	143.4491	153.9031	167.0993	179.5018	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	(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)	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	(71)
Water heating gains (Table 5)	144.3262	142.0840	137.7644	128.2968	122.4977	116.4362	112.7130	115.7889	119.3951	126.1210	135.1968	143.1156	(72)

Total internal gains

	482.0096	491.8643	472.4860	455.7217	433.5692	418.2623	403.0962	404.2234	415.8974	429.9200	455.3493	472.5134 (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	1.2000	10.6334	0.7600	0.7000	0.7700	4.7043 (74)
East	6.3000	19.6403	0.7600	0.7000	0.7700	45.6176 (76)
South	1.0000	46.7521	0.7600	0.7000	0.7700	17.2364 (78)
West	9.1300	19.6403	0.7600	0.7000	0.7700	66.1094 (80)

Solar gains	133.6677	255.7806	411.1750	590.1299	718.7525	734.7231	699.8545	603.4630	474.5553	300.4909	165.5448	110.6944 (83)
Total gains	615.6773	747.6450	883.6609	1045.8516	1152.3216	1152.9853	1102.9507	1007.6864	890.4527	730.4109	620.8940	583.2078 (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	66.7493	66.8278	66.9048	67.2692	67.3378	67.6591	67.6591	67.7189	67.5350	67.3378	67.1992	67.0548	
alpha	5.4500	5.4552	5.4603	5.4846	5.4892	5.5106	5.5106	5.5146	5.5023	5.4892	5.4799	5.4703	
util living area	0.9934	0.9812	0.9432	0.8261	0.6404	0.4527	0.3272	0.3736	0.6172	0.9053	0.9840	0.9950	(86)
Living	19.9355	20.1724	20.4927	20.8142	20.9594	20.9948	20.9993	20.9986	20.9749	20.7301	20.2628	19.8890	
Non living	18.6672	18.9658	19.3569	19.7181	19.8528	19.8823	19.8843	19.8850	19.8700	19.6445	19.0871	18.6116	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4554	20.1724	20.4927	20.8142	20.9594	20.9948	20.9993	20.9986	20.9749	20.7301	20.2628	20.0444	(87)
Th 2	19.8710	19.8722	19.8734	19.8788	19.8798	19.8845	19.8845	19.8853	19.8827	19.8798	19.8777	19.8756	(88)
util rest of house	0.9909	0.9743	0.9241	0.7799	0.5726	0.3754	0.2445	0.2837	0.5264	0.8652	0.9769	0.9931	(89)
MIT 2	19.3911	18.9658	19.3569	19.7181	19.8528	19.8823	19.8843	19.8850	19.8700	19.6445	19.0871	18.8394	(90)
Living area fraction										fLA = Living area / (4) =		0.3939	(91)
MIT	19.8104	19.4411	19.8043	20.1499	20.2887	20.3205	20.3235	20.3237	20.3053	20.0722	19.5502	19.3141	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8104	19.4411	19.8043	20.1499	20.2887	20.3205	20.3235	20.3237	20.3053	20.0722	19.5502	19.3141	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9907	0.9710	0.9227	0.7919	0.5980	0.4058	0.2771	0.3192	0.5617	0.8731	0.9742	0.9918	(94)
Useful gains	609.9449	725.9629	815.3451	828.1861	689.0909	467.9288	305.6825	321.6190	500.1704	637.7506	604.8777	578.4162	(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	1291.4670	1209.3403	1105.2050	929.4795	708.8881	469.9142	305.8709	322.0252	510.6724	781.8038	1029.7258	1252.7366	(97)
Space heating kWh	507.0525	324.8296	215.6558	72.9312	14.7291	0.0000	0.0000	0.0000	0.0000	107.1756	305.8906	501.6944	(98a)
Space heating requirement - total per year (kWh/year)												2049.9588	
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	507.0525	324.8296	215.6558	72.9312	14.7291	0.0000	0.0000	0.0000	0.0000	107.1756	305.8906	501.6944	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2049.9588	
Space heating per m2											(98c) / (4) =	31.0600	(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 %)	252.8487	(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	507.0525	324.8296	215.6558	72.9312	14.7291	0.0000	0.0000	0.0000	0.0000	107.1756	305.8906	501.6944	(98)
Space heating efficiency (main heating system 1)	252.8487	252.8487	252.8487	252.8487	252.8487	0.0000	0.0000	0.0000	0.0000	252.8487	252.8487	252.8487	(210)
Space heating fuel (main heating system)	200.5359	128.4680	85.2905	28.8438	5.8253	0.0000	0.0000	0.0000	0.0000	42.3872	120.9777	198.4168	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating
Water heating requirement

	247.8700	219.3510	233.1875	205.1640	199.0269	179.4809	177.1327	184.0151	185.8882	207.1343	220.1054	245.1613 (64)

Efficiency of water heater 169.3820 (216)

(217)m	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820 (217)

Fuel for water heating, kWh/month

	146.3379	129.5008	137.6696	121.1251	117.5018	105.9622	104.5759	108.6392	109.7450	122.2883	129.9462	144.7388 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	24.5155	19.6673	17.7082	12.9738	10.0213	8.1875	9.1418	11.8828	15.4346	20.2511	22.8736	25.1969 (232)

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

(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

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

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	810.7453 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	169.3820
Water heating fuel used	1478.0307 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	197.8544 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	2486.6305 (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	810.7453	0.1573	127.5595	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1478.0307	0.1409	208.1932	(264)
Space and water heating			335.7527	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	197.8544	0.1443	28.5565	(268)
Total CO2, kg/year			364.3092	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.5200	(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	810.7453	1.5824	1282.9311	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1478.0307	1.5208	2247.8506	(278)
Space and water heating			3530.7817	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	197.8544	1.5338	303.4758	(282)
Total Primary energy kWh/year			3834.2574	(286)
Dwelling Primary energy Rate (DPER)			58.0900	(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	66.0000 (1b)	x	2.4000 (2b)	=	158.4000 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 66.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	158.4000	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1263 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3763 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3480 (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	0.4438	0.4351	0.4264	0.3828	0.3741	0.3306	0.3306	0.3219	0.3480	0.3741	0.3915	0.4090	(22b)
Effective ac	0.5985	0.5946	0.5909	0.5733	0.5700	0.5547	0.5547	0.5518	0.5606	0.5700	0.5767	0.5836	(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 Opening Type (Uw = 1.20)			16.5000	1.1450	18.8931			(27)
Heatloss Floor 1			66.0000	0.1300	8.5800			(28a)
External Wall 1	81.6000	16.5000	65.1000	0.1800	11.7180			(29a)
External Roof 1	66.0000		66.0000	0.1100	7.2600			(30)
Total net area of external elements Aum(A, m2)			213.6000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.4511			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	303.1561	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	34.0000	0.1600	5.4400
E16 Corner (normal)	9.6000	0.0900	0.8640
E2 Other lintels (including other steel lintels)	11.2600	0.0500	0.5630
E3 Sill	4.7000	0.0500	0.2350
E4 Jamb	25.2000	0.0500	1.2600
E10 Eaves (insulation at ceiling level)	26.0000	0.0600	1.5600
E12 Gable (insulation at ceiling level)	8.0000	0.0600	0.4800

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.4020	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	56.8531	(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	31.2827	31.0828	30.8869	29.9668	29.7947	28.9933	28.9933	28.8449	29.3020	29.7947	30.1429	30.5070	(38)
Heat transfer coeff	88.1358	87.9359	87.7400	86.8199	86.6478	85.8464	85.8464	85.6980	86.1551	86.6478	86.9960	87.3601	(39)
Average = Sum(39)m / 12 =												86.8191	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3354	1.3324	1.3294	1.3155	1.3128	1.3007	1.3007	1.2985	1.3054	1.3128	1.3181	1.3236	(40)
HLP (average)												1.3154	
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 2.1452 (42)

Hot water usage for mixer showers

60.1883	59.2838	57.9658	55.4439	53.5828	51.5074	50.3277	51.6358	53.0697	55.2981	57.8741	59.9577 (42a)

Hot water usage for baths

26.0062	25.6199	25.0761	24.0732	23.3223	22.4897	22.0399	22.5800	23.1681	24.0590	25.0825	25.9183 (42b)

Hot water usage for other uses

36.5995	35.2686	33.9377	32.6068	31.2759	29.9450	29.9450	31.2759	32.6068	33.9377	35.2686	36.5995 (42c)

Average daily hot water use (litres/day) 112.8757 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	122.7940	120.1723	116.9795	112.1239	108.1810	103.9421	102.3126	105.4917	108.8445	113.2948	118.2252	122.4754	(44)
Energy conte	194.4756	171.1238	179.7931	153.4920	145.6325	127.8089	123.7383	130.6207	134.2162	153.7399	168.4334	191.7669	(45)
Energy content (annual)										Total = Sum(45)m =		1874.8415	

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

29.1713	25.6686	26.9690	23.0238	21.8449	19.1713	18.5607	19.5931	20.1324	23.0610	25.2650	28.7650	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

241.0705	213.2095	226.3880	198.5839	192.2274	172.9007	170.3332	177.2156	179.3080	200.3348	213.5253	238.3618	(62)
WWHRS	-27.5156	-24.3350	-25.4822	-21.1003	-19.6647	-16.8272	-15.7728	-16.7728	-17.4101	-20.5246	-23.2519	-27.0060	(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

213.5549	188.8745	200.9058	177.4836	172.5627	156.0735	154.5603	160.4428	161.8979	179.8102	190.2734	211.3558	(64)
								Total per year (kWh/year) = Sum(64)m =			2167.7955	(64)

12Total per year (kWh/year) 2168 (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

101.9391	90.5672	97.0571	87.1096	85.6987	78.5699	78.4189	80.7073	80.7004	88.3945	92.0776	101.0384	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	(66)

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

94.7172	104.8655	94.7172	97.8745	94.7172	97.8745	94.7172	94.7172	97.8745	94.7172	97.8745	94.7172	(67)

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

187.7875	189.7362	184.8256	174.3717	161.1755	148.7729	140.4872	138.5386	143.4491	153.9031	167.0993	179.5018	(68)

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

33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	(71)

Water heating gains (Table 5)

137.0149	134.7727	130.4531	120.9855	115.1865	109.1249	105.4017	108.4776	112.0838	118.8097	127.8855	135.8043	(72)

Total internal gains

477.6983	487.5530	468.1747	451.4104	429.2579	410.9510	395.7849	396.9121	408.5861	425.6087	451.0380	468.2021	(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	1.1200	10.6334	0.6300	0.7000	0.7700	3.6397	(74)
East	5.9000	19.6403	0.6300	0.7000	0.7700	35.4137	(76)
South	0.9400	46.7521	0.6300	0.7000	0.7700	13.4308	(78)
West	8.5400	19.6403	0.6300	0.7000	0.7700	51.2598	(80)

Solar gains	103.7439	198.5035	319.0660	457.8893	557.6579	570.0369	542.9889	468.2223	368.2331	233.1920	128.4817	85.9157	(83)
Total gains	581.4422	686.0565	787.2407	909.2996	986.9158	980.9879	938.7738	865.1344	776.8192	658.8008	579.5197	554.1178	(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	63.0602	63.2035	63.3446	64.0160	64.1431	64.7419	64.7419	64.8540	64.5100	64.1431	63.8864	63.6201
alpha	5.2040	5.2136	5.2230	5.2677	5.2762	5.3161	5.3161	5.3236	5.3007	5.2762	5.2591	5.2413
util living area												

	0.9952	0.9881	0.9673	0.8945	0.7451	0.5485	0.4005	0.4519	0.7119	0.9401	0.9890	0.9962 (86)
MIT	19.7929	20.0023	20.3091	20.6785	20.9044	20.9845	20.9976	20.9955	20.9437	20.6179	20.1381	19.7604 (87)
Th 2	19.8132	19.8156	19.8179	19.8287	19.8308	19.8403	19.8403	19.8420	19.8366	19.8308	19.8267	19.8224 (88)
util rest of house												
	0.9933	0.9834	0.9546	0.8578	0.6746	0.4546	0.2960	0.3402	0.6139	0.9100	0.9839	0.9947 (89)
MIT 2	18.4437	18.7106	19.0941	19.5351	19.7634	19.8335	19.8398	19.8409	19.8064	19.4822	18.8930	18.4090 (90)
Living area fraction										fLA = Living area / (4) =		0.3939 (91)
MIT	18.9752	19.2195	19.5728	19.9855	20.2129	20.2869	20.2959	20.2958	20.2544	19.9296	19.3835	18.9414 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9752	19.2195	19.5728	19.9855	20.2129	20.2869	20.2959	20.2958	20.2544	19.9296	19.3835	18.9414 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9804	0.9514	0.8633	0.6990	0.4915	0.3373	0.3844	0.6511	0.9131	0.9813	0.9931	(94)
Useful gains	576.4154	672.5783	748.9837	785.0220	689.8414	482.1249	316.6184	332.5678	505.7978	601.5304	568.6667	550.2994	(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	1293.4098	1259.1948	1147.0060	962.4422	737.6240	488.2035	317.2764	333.8603	530.2331	808.3890	1068.6174	1287.8079	(97)
Space heating kWh	533.4438	394.2062	296.1286	127.7425	35.5502	0.0000	0.0000	0.0000	0.0000	153.9028	359.9645	548.7064	(98a)
Space heating requirement - total per year (kWh/year)												2449.6452	
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	533.4438	394.2062	296.1286	127.7425	35.5502	0.0000	0.0000	0.0000	0.0000	153.9028	359.9645	548.7064	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2449.6452	
Space heating per m2											(98c) / (4) =	37.1158	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	533.4438	394.2062	296.1286	127.7425	35.5502	0.0000	0.0000	0.0000	0.0000	153.9028	359.9645	548.7064	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	577.9456	427.0924	320.8328	138.3992	38.5160	0.0000	0.0000	0.0000	0.0000	166.7420	389.9941	594.4814	(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													
	213.5549	188.8745	200.9058	177.4836	172.5627	156.0735	154.5603	160.4428	161.8979	179.8102	190.2734	211.3558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0263	85.6702	84.9283	83.3348	81.2059	79.8000	79.8000	79.8000	79.8000	83.7129	85.4668	86.0997	(217)
Fuel for water heating, kWh/month													
	248.2438	220.4669	236.5592	212.9765	212.5001	195.5808	193.6846	201.0561	202.8796	214.7940	222.6285	245.4779	(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	19.6804	15.7883	14.2156	10.4150	8.0448	6.5727	7.3388	9.5392	12.3905	16.2570	18.3622	20.2273	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-51.5199	-67.9918	-91.5996	-96.3844	-98.7661	-90.4691	-89.3652	-86.8004	-81.6567	-74.4705	-54.9730	-45.1116	(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	-45.1171	-92.4572	-179.4222	-263.4496	-342.7306	-342.3148	-338.2415	-288.8571	-215.1179	-130.0422	-59.4945	-35.8624	(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	2654.0035	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2606.8482	(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)	158.8319 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3262.2154 (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	2243.4682 (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	2654.0035	0.2100	557.3407	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2606.8482	0.2100	547.4381	(264)
Space and water heating			1104.7788	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	158.8319	0.1443	22.9243	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.1082	0.1360	-126.3529	
PV Unit electricity exported	-2333.1071	0.1266	-295.3243	
Total			-421.6773	(269)
Total CO2, kg/year			717.9552	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8800	(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	2654.0035	1.1300	2999.0239	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2606.8482	1.1300	2945.7384	(278)
Space and water heating			5944.7624	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	158.8319	1.5338	243.6216	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.1082	1.5027	-1396.1582	
PV Unit electricity exported	-2333.1071	0.4647	-1084.1147	
Total			-2480.2729	(283)
Total Primary energy kWh/year			3838.2119	(286)
Target Primary Energy Rate (TPER)			58.1500	(287)

Full SAP Calculation Printout

Property Reference	House Type F	Issued on Date	05/10/2023
Assessment Reference	Plot 2	Prop Type Ref	
Property			

SAP Rating	81 B	DER	5.14	TER	10.88
Environmental	96 A	% DER < TER			52.76
CO_2 Emissions (t/year)	0.31	DFEE	41.01	TFEE	45.83
Compliance Check	See BREL	% DFEE < TFEE			10.51
% DPER < TPER	7.22	DPER	53.95	TPER	58.15

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	66.0000	(1b)	x 2.4000	(2b) =	158.4000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.0000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	158.4000	(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	1 * 10 =	10.0000 (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) =	10.0000 / (5) =	0.0631 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2631 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2434 (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	0.3103	0.3042	0.2982	0.2677	0.2617	0.2312	0.2312	0.2251	0.2434	0.2617	0.2738	0.2860	(22b)
Effective ac	0.5482	0.5463	0.5444	0.5358	0.5342	0.5267	0.5267	0.5253	0.5296	0.5342	0.5375	0.5409	(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	
Opening Type 1 (Uw = 1.20)			17.6300	1.1450	20.1870			(27)
Heatloss Floor 1			66.0000	0.1200	7.9200	110.0000	7260.0000	(28a)
External Wall 1	81.6000	17.6300	63.9700	0.1900	12.1543	190.0000	12154.3000	(29a)
External Roof 1	66.0000		66.0000	0.1500	9.9000	9.0000	594.0000	(30)
Total net area of external elements Aum(A, m2)			213.6000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.1613			(33)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		20008.3000	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 303.1561 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E5 Ground floor (normal)	34.0000	0.0670	2.2780
	E16 Corner (normal)	9.6000	0.0000	0.0000
	E2 Other lintels (including other steel lintels)	11.2600	0.0240	0.2702
	E3 Sill	4.7000	0.0190	0.0893
	E4 Jamb	25.2000	0.0140	0.3528
	E10 Eaves (insulation at ceiling level)	26.0000	0.0460	1.1960
	E12 Gable (insulation at ceiling level)	8.0000	0.0330	0.2640

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.4503 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 54.6117 (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	28.6530	28.5553	28.4595	28.0095	27.9253	27.5334	27.5334	27.4608	27.6843	27.9253	28.0956	28.2737	(38)
Heat transfer coeff	83.2647	83.1670	83.0711	82.6212	82.5370	82.1450	82.1450	82.0725	82.2960	82.5370	82.7073	82.8853	(39)

Average = Sum(39)m / 12 = 82.6208

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2616	1.2601	1.2587	1.2518	1.2506	1.2446	1.2446	1.2435	1.2469	1.2506	1.2531	1.2558	(40)
HLP (average)												1.2518	
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 2.1452 (42)

Hot water usage for mixer showers

60.1883	59.2838	57.9658	55.4439	53.5828	51.5074	50.3277	51.6358	53.0697	55.2981	57.8741	59.9577	(42a)

Hot water usage for baths

26.0062	25.6199	25.0761	24.0732	23.3223	22.4897	22.0399	22.5800	23.1681	24.0590	25.0825	25.9183	(42b)

Hot water usage for other uses

36.5995	35.2686	33.9377	32.6068	31.2759	29.9450	29.9450	31.2759	32.6068	33.9377	35.2686	36.5995	(42c)

Average daily hot water use (litres/day) 112.8757 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.7940	120.1723	116.9795	112.1239	108.1810	103.9421	102.3126	105.4917	108.8445	113.2948	118.2252	122.4754	(44)
Energy conte	194.4756	171.1238	179.7931	153.4920	145.6325	127.8089	123.7383	130.6207	134.2162	153.7399	168.4334	191.7669	(45)

Energy content (annual) Total = Sum(45)m = 1874.8415

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

29.1713	25.6686	26.9690	23.0238	21.8449	19.1713	18.5607	19.5931	20.1324	23.0610	25.2650	28.7650	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9720 (55)

Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

247.8700	219.3510	233.1875	205.1640	199.0269	179.4809	177.1327	184.0151	185.8882	207.1343	220.1054	245.1613	(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 -0.4925	-1.1051	-2.3416	-3.7688	-5.2137	-5.3335	-5.2624	-4.3030	-3.0022	-1.6377	-0.6738	-0.3830	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

247.3775	218.2459	230.8460	201.3952	193.8132	174.1474	171.8703	179.7122	182.8859	205.4967	219.4316	244.7784	(64)

Total per year (kWh/year) = Sum(64)m = 2470.0003 (64)

12Total per year (kWh/year) 2470 (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

107.3787	95.4804	102.4967	92.3737	91.1383	83.8341	83.8585	86.1469	85.9645	93.8340	97.3417	106.4780	(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	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.7172	104.8655	94.7172	97.8745	94.7172	97.8745	94.7172	94.7172	97.8745	94.7172	97.8745	94.7172	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.7875	189.7362	184.8256	174.3717	161.1755	148.7729	140.4872	138.5386	143.4491	153.9031	167.0993	179.5018	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	(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)	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	(71)
Water heating gains (Table 5)	144.3262	142.0840	137.7644	128.2968	122.4977	116.4362	112.7130	115.7889	119.3951	126.1210	135.1968	143.1156	(72)

Total internal gains

	482.0096	491.8643	472.4860	455.7217	433.5692	418.2623	403.0962	404.2234	415.8974	429.9200	455.3493	472.5134 (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	1.2000	10.6334	0.7600	0.7000	0.7700	4.7043 (74)
East	6.3000	19.6403	0.7600	0.7000	0.7700	45.6176 (76)
South	1.0000	46.7521	0.7600	0.7000	0.7700	17.2364 (78)
West	9.1300	19.6403	0.7600	0.7000	0.7700	66.1094 (80)

Solar gains	133.6677	255.7806	411.1750	590.1299	718.7525	734.7231	699.8545	603.4630	474.5553	300.4909	165.5448	110.6944 (83)
Total gains	615.6773	747.6450	883.6609	1045.8516	1152.3216	1152.9853	1102.9507	1007.6864	890.4527	730.4109	620.8940	583.2078 (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	66.7493	66.8278	66.9048	67.2692	67.3378	67.6591	67.6591	67.7189	67.5350	67.3378	67.1992	67.0548	
alpha	5.4500	5.4552	5.4603	5.4846	5.4892	5.5106	5.5106	5.5146	5.5023	5.4892	5.4799	5.4703	
util living area	0.9934	0.9812	0.9432	0.8261	0.6404	0.4527	0.3272	0.3736	0.6172	0.9053	0.9840	0.9950	(86)
Living	19.9355	20.1724	20.4927	20.8142	20.9594	20.9948	20.9993	20.9986	20.9749	20.7301	20.2628	19.8890	
Non living	18.6672	18.9658	19.3569	19.7181	19.8528	19.8823	19.8843	19.8850	19.8700	19.6445	19.0871	18.6116	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4554	20.1724	20.4927	20.8142	20.9594	20.9948	20.9993	20.9986	20.9749	20.7301	20.2628	20.0444	(87)
Th 2	19.8710	19.8722	19.8734	19.8788	19.8798	19.8845	19.8845	19.8853	19.8827	19.8798	19.8777	19.8756	(88)
util rest of house	0.9909	0.9743	0.9241	0.7799	0.5726	0.3754	0.2445	0.2837	0.5264	0.8652	0.9769	0.9931	(89)
MIT 2	19.3911	18.9658	19.3569	19.7181	19.8528	19.8823	19.8843	19.8850	19.8700	19.6445	19.0871	18.8394	(90)
Living area fraction										fLA = Living area / (4) =		0.3939	(91)
MIT	19.8104	19.4411	19.8043	20.1499	20.2887	20.3205	20.3235	20.3237	20.3053	20.0722	19.5502	19.3141	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8104	19.4411	19.8043	20.1499	20.2887	20.3205	20.3235	20.3237	20.3053	20.0722	19.5502	19.3141	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9907	0.9710	0.9227	0.7919	0.5980	0.4058	0.2771	0.3192	0.5617	0.8731	0.9742	0.9918	(94)
Useful gains	609.9449	725.9629	815.3451	828.1861	689.0909	467.9288	305.6825	321.6190	500.1704	637.7506	604.8777	578.4162	(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	1291.4670	1209.3403	1105.2050	929.4795	708.8881	469.9142	305.8709	322.0252	510.6724	781.8038	1029.7258	1252.7366	(97)
Space heating kWh	507.0525	324.8296	215.6558	72.9312	14.7291	0.0000	0.0000	0.0000	0.0000	107.1756	305.8906	501.6944	(98a)
Space heating requirement - total per year (kWh/year)												2049.9588	
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	507.0525	324.8296	215.6558	72.9312	14.7291	0.0000	0.0000	0.0000	0.0000	107.1756	305.8906	501.6944	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2049.9588	
Space heating per m2											(98c) / (4) =	31.0600	(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 %)	252.8487	(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	507.0525	324.8296	215.6558	72.9312	14.7291	0.0000	0.0000	0.0000	0.0000	107.1756	305.8906	501.6944	(98)
Space heating efficiency (main heating system 1)	252.8487	252.8487	252.8487	252.8487	252.8487	0.0000	0.0000	0.0000	0.0000	252.8487	252.8487	252.8487	(210)
Space heating fuel (main heating system)	200.5359	128.4680	85.2905	28.8438	5.8253	0.0000	0.0000	0.0000	0.0000	42.3872	120.9777	198.4168	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating
Water heating requirement

	247.3775	218.2459	230.8460	201.3952	193.8132	174.1474	171.8703	179.7122	182.8859	205.4967	219.4316	244.7784 (64)

Efficiency of water heater

												169.3820 (216)
(217)m	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820 (217)

Fuel for water heating, kWh/month

	146.0472	128.8484	136.2872	118.9000	114.4238	102.8134	101.4691	106.0988	107.9725	121.3215	129.5484	144.5127 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	24.5155	19.6673	17.7082	12.9738	10.0213	8.1875	9.1418	11.8828	15.4346	20.2511	22.8736	25.1969 (232)

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

(233a)m	-5.4492	-8.7026	-14.1171	-17.8333	-21.0676	-20.3628	-20.0945	-17.9734	-14.5945	-10.6683	-6.3173	-4.5947 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

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

(233b)m	-0.0140	-0.0991	-0.3627	-0.8717	-1.4214	-1.5168	-1.4966	-1.2184	-0.8452	-0.3335	-0.0632	-0.0094 (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	810.7453 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	169.3820
Water heating fuel used	1458.2428 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	197.8544 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-170.0274 (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	2296.8152 (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	810.7453	0.1573	127.5595	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1458.2428	0.1410	205.6535	(264)
Space and water heating			333.2130	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	197.8544	0.1443	28.5565	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-161.7752	0.1322	-21.3929	
PV Unit electricity exported	-8.2522	0.1170	-0.9651	
Total			-22.3581	(269)
Total CO2, kg/year			339.4115	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.1400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	810.7453	1.5824	1282.9311	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1458.2428	1.5215	2218.6840	(278)
Space and water heating			3501.6150	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	197.8544	1.5338	303.4758	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-161.7752	1.4886	-240.8180	
PV Unit electricity exported	-8.2522	0.4289	-3.5397	
Total			-244.3577	(283)
Total Primary energy kWh/year			3560.7331	(286)
Dwelling Primary energy Rate (DPER)			53.9500	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	66.0000	(1b)	x 2.4000	(2b) =	158.4000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 66.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		158.4000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1263 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3763 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3480 (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	0.4438	0.4351	0.4264	0.3828	0.3741	0.3306	0.3306	0.3219	0.3480	0.3741	0.3915	0.4090	(22b)
Effective ac	0.5985	0.5946	0.5909	0.5733	0.5700	0.5547	0.5547	0.5518	0.5606	0.5700	0.5767	0.5836	(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 Opening Type (Uw = 1.20)			16.5000	1.1450	18.8931			(27)
Heatloss Floor 1			66.0000	0.1300	8.5800			(28a)
External Wall 1	81.6000	16.5000	65.1000	0.1800	11.7180			(29a)
External Roof 1	66.0000		66.0000	0.1100	7.2600			(30)
Total net area of external elements Aum(A, m2)			213.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.4511			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							303.1561	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E5	Ground floor (normal)	34.0000	0.1600	5.4400
E16	Corner (normal)	9.6000	0.0900	0.8640
E2	Other lintels (including other steel lintels)	11.2600	0.0500	0.5630
E3	Sill	4.7000	0.0500	0.2350
E4	Jamb	25.2000	0.0500	1.2600
E10	Eaves (insulation at ceiling level)	26.0000	0.0600	1.5600
E12	Gable (insulation at ceiling level)	8.0000	0.0600	0.4800

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.4020	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	56.8531	(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	31.2827	31.0828	30.8869	29.9668	29.7947	28.9933	28.9933	28.8449	29.3020	29.7947	30.1429	30.5070	(38)
Heat transfer coeff	88.1358	87.9359	87.7400	86.8199	86.6478	85.8464	85.8464	85.6980	86.1551	86.6478	86.9960	87.3601	(39)
Average = Sum(39)m / 12 =												86.8191	

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

HLP	1.3354	1.3324	1.3294	1.3155	1.3128	1.3007	1.3007	1.2985	1.3054	1.3128	1.3181	1.3236 (40)
HLP (average)												1.3154
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 2.1452 (42)

Hot water usage for mixer showers

60.1883	59.2838	57.9658	55.4439	53.5828	51.5074	50.3277	51.6358	53.0697	55.2981	57.8741	59.9577 (42a)

Hot water usage for baths

26.0062	25.6199	25.0761	24.0732	23.3223	22.4897	22.0399	22.5800	23.1681	24.0590	25.0825	25.9183 (42b)

Hot water usage for other uses

36.5995	35.2686	33.9377	32.6068	31.2759	29.9450	29.9450	31.2759	32.6068	33.9377	35.2686	36.5995 (42c)

Average daily hot water use (litres/day) 112.8757 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	122.7940	120.1723	116.9795	112.1239	108.1810	103.9421	102.3126	105.4917	108.8445	113.2948	118.2252	122.4754	(44)
Energy conte	194.4756	171.1238	179.7931	153.4920	145.6325	127.8089	123.7383	130.6207	134.2162	153.7399	168.4334	191.7669	(45)

Energy content (annual) Total = Sum(45)m = 1874.8415

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

29.1713	25.6686	26.9690	23.0238	21.8449	19.1713	18.5607	19.5931	20.1324	23.0610	25.2650	28.7650	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

241.0705	213.2095	226.3880	198.5839	192.2274	172.9007	170.3332	177.2156	179.3080	200.3348	213.5253	238.3618	(62)
WWHRS -27.5156	-24.3350	-25.4822	-21.1003	-19.6647	-16.8272	-15.7728	-16.7728	-17.4101	-20.5246	-23.2519	-27.0060	(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

213.5549	188.8745	200.9058	177.4836	172.5627	156.0735	154.5603	160.4428	161.8979	179.8102	190.2734	211.3558	(64)

Total per year (kWh/year) = Sum(64)m = 2167.7955 (64)

12Total per year (kWh/year) 2168 (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

101.9391	90.5672	97.0571	87.1096	85.6987	78.5699	78.4189	80.7073	80.7004	88.3945	92.0776	101.0384	(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	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	(66)

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

94.7172	104.8655	94.7172	97.8745	94.7172	97.8745	94.7172	94.7172	97.8745	94.7172	97.8745	94.7172	(67)

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

187.7875	189.7362	184.8256	174.3717	161.1755	148.7729	140.4872	138.5386	143.4491	153.9031	167.0993	179.5018	(68)

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

33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	(71)

Water heating gains (Table 5)

137.0149	134.7727	130.4531	120.9855	115.1865	109.1249	105.4017	108.4776	112.0838	118.8097	127.8855	135.8043	(72)

Total internal gains

477.6983	487.5530	468.1747	451.4104	429.2579	410.9510	395.7849	396.9121	408.5861	425.6087	451.0380	468.2021	(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	1.1200	10.6334	0.6300	0.7000	0.7700	3.6397	(74)
East	5.9000	19.6403	0.6300	0.7000	0.7700	35.4137	(76)
South	0.9400	46.7521	0.6300	0.7000	0.7700	13.4308	(78)
West	8.5400	19.6403	0.6300	0.7000	0.7700	51.2598	(80)

Solar gains	103.7439	198.5035	319.0660	457.8893	557.6579	570.0369	542.9889	468.2223	368.2331	233.1920	128.4817	85.9157	(83)
Total gains	581.4422	686.0565	787.2407	909.2996	986.9158	980.9879	938.7738	865.1344	776.8192	658.8008	579.5197	554.1178	(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	63.0602	63.2035	63.3446	64.0160	64.1431	64.7419	64.7419	64.8540	64.5100	64.1431	63.8864	63.6201	
alpha	5.2040	5.2136	5.2230	5.2677	5.2762	5.3161	5.3161	5.3236	5.3007	5.2762	5.2591	5.2413	
util living area	0.9952	0.9881	0.9673	0.8945	0.7451	0.5485	0.4005	0.4519	0.7119	0.9401	0.9890	0.9962	(86)
MIT	19.7929	20.0023	20.3091	20.6785	20.9044	20.9845	20.9976	20.9955	20.9437	20.6179	20.1381	19.7604	(87)
Th 2	19.8132	19.8156	19.8179	19.8287	19.8308	19.8403	19.8403	19.8420	19.8366	19.8308	19.8267	19.8224	(88)
util rest of house	0.9933	0.9834	0.9546	0.8578	0.6746	0.4546	0.2960	0.3402	0.6139	0.9100	0.9839	0.9947	(89)
MIT 2	18.4437	18.7106	19.0941	19.5351	19.7634	19.8335	19.8398	19.8409	19.8064	19.4822	18.8930	18.4090	(90)
Living area fraction									fLA = Living area / (4) =			0.3939	(91)
MIT	18.9752	19.2195	19.5728	19.9855	20.2129	20.2869	20.2959	20.2958	20.2544	19.9296	19.3835	18.9414	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9752	19.2195	19.5728	19.9855	20.2129	20.2869	20.2959	20.2958	20.2544	19.9296	19.3835	18.9414	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9804	0.9514	0.8633	0.6990	0.4915	0.3373	0.3844	0.6511	0.9131	0.9813	0.9931	(94)
Useful gains	576.4154	672.5783	748.9837	785.0220	689.8414	482.1249	316.6184	332.5678	505.7978	601.5304	568.6667	550.2994	(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	1293.4098	1259.1948	1147.0060	962.4422	737.6240	488.2035	317.2764	333.8603	530.2331	808.3890	1068.6174	1287.8079	(97)
Space heating kWh	533.4438	394.2062	296.1286	127.7425	35.5502	0.0000	0.0000	0.0000	0.0000	153.9028	359.9645	548.7064	(98a)
Space heating requirement - total per year (kWh/year)												2449.6452	
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	533.4438	394.2062	296.1286	127.7425	35.5502	0.0000	0.0000	0.0000	0.0000	153.9028	359.9645	548.7064	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2449.6452	
Space heating per m2											(98c) / (4) =	37.1158	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	533.4438	394.2062	296.1286	127.7425	35.5502	0.0000	0.0000	0.0000	0.0000	153.9028	359.9645	548.7064	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	577.9456	427.0924	320.8328	138.3992	38.5160	0.0000	0.0000	0.0000	0.0000	166.7420	389.9941	594.4814	(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	213.5549	188.8745	200.9058	177.4836	172.5627	156.0735	154.5603	160.4428	161.8979	179.8102	190.2734	211.3558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0263	85.6702	84.9283	83.3348	81.2059	79.8000	79.8000	79.8000	79.8000	83.7129	85.4668	86.0997	(217)
Fuel for water heating, kWh/month	248.2438	220.4669	236.5592	212.9765	212.5001	195.5808	193.6846	201.0561	202.8796	214.7940	222.6285	245.4779	(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	19.6804	15.7883	14.2156	10.4150	8.0448	6.5727	7.3388	9.5392	12.3905	16.2570	18.3622	20.2273	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-51.5199	-67.9918	-91.5996	-96.3844	-98.7661	-90.4691	-89.3652	-86.8004	-81.6567	-74.4705	-54.9730	-45.1116	(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	-45.1171	-92.4572	-179.4222	-263.4496	-342.7306	-342.3148	-338.2415	-288.8571	-215.1179	-130.0422	-59.4945	-35.8624	(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	2654.0035 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2606.8482 (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)	158.8319 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3262.2154 (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	2243.4682 (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	2654.0035	0.2100	557.3407	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2606.8482	0.2100	547.4381	(264)
Space and water heating			1104.7788	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	158.8319	0.1443	22.9243	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.1082	0.1360	-126.3529	
PV Unit electricity exported	-2333.1071	0.1266	-295.3243	
Total			-421.6773	(269)
Total CO2, kg/year			717.9552	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8800	(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	2654.0035	1.1300	2999.0239	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2606.8482	1.1300	2945.7384	(278)
Space and water heating			5944.7624	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	158.8319	1.5338	243.6216	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.1082	1.5027	-1396.1582	
PV Unit electricity exported	-2333.1071	0.4647	-1084.1147	
Total			-2480.2729	(283)
Total Primary energy kWh/year			3838.2119	(286)
Target Primary Energy Rate (TPER)			58.1500	(287)

Full SAP Calculation Printout

Property Reference	House Type F	Issued on Date	05/10/2023
Assessment Reference	Plot 3	Prop Type Ref	
Property			

SAP Rating	81 B	DER	5.14	TER	10.88
Environmental	96 A	% DER < TER			52.76
CO_2 Emissions (t/year)	0.31	DFEE	41.01	TFEE	45.83
Compliance Check	See BREL	% DFEE < TFEE			10.51
% DPER < TPER	7.22	DPER	53.95	TPER	58.15

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	66.0000 (1b)	x	2.4000 (2b)	=	158.4000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	158.4000	(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	1 * 10 =	10.0000 (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) =	10.0000 / (5) =	0.0631 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2631 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2434 (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	0.3103	0.3042	0.2982	0.2677	0.2617	0.2312	0.2312	0.2251	0.2434	0.2617	0.2738	0.2860	(22b)
Effective ac	0.5482	0.5463	0.5444	0.5358	0.5342	0.5267	0.5267	0.5253	0.5296	0.5342	0.5375	0.5409	(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	
Opening Type 1 (Uw = 1.20)			17.6300	1.1450	20.1870			(27)
Heatloss Floor 1			66.0000	0.1200	7.9200	110.0000	7260.0000	(28a)
External Wall 1	81.6000	17.6300	63.9700	0.1900	12.1543	190.0000	12154.3000	(29a)
External Roof 1	66.0000		66.0000	0.1500	9.9000	9.0000	594.0000	(30)
Total net area of external elements Aum(A, m2)			213.6000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.1613			(33)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		20008.3000	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 303.1561 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E5 Ground floor (normal)	34.0000	0.0670	2.2780
	E16 Corner (normal)	9.6000	0.0000	0.0000
	E2 Other lintels (including other steel lintels)	11.2600	0.0240	0.2702
	E3 Sill	4.7000	0.0190	0.0893
	E4 Jamb	25.2000	0.0140	0.3528
	E10 Eaves (insulation at ceiling level)	26.0000	0.0460	1.1960
	E12 Gable (insulation at ceiling level)	8.0000	0.0330	0.2640

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.4503 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 54.6117 (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	28.6530	28.5553	28.4595	28.0095	27.9253	27.5334	27.5334	27.4608	27.6843	27.9253	28.0956	28.2737	(38)
Heat transfer coeff	83.2647	83.1670	83.0711	82.6212	82.5370	82.1450	82.1450	82.0725	82.2960	82.5370	82.7073	82.8853	(39)

Average = Sum(39)m / 12 = 82.6208

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2616	1.2601	1.2587	1.2518	1.2506	1.2446	1.2446	1.2435	1.2469	1.2506	1.2531	1.2558	(40)
HLP (average)												1.2518	
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 2.1452 (42)

Hot water usage for mixer showers

60.1883	59.2838	57.9658	55.4439	53.5828	51.5074	50.3277	51.6358	53.0697	55.2981	57.8741	59.9577	(42a)

Hot water usage for baths

26.0062	25.6199	25.0761	24.0732	23.3223	22.4897	22.0399	22.5800	23.1681	24.0590	25.0825	25.9183	(42b)

Hot water usage for other uses

36.5995	35.2686	33.9377	32.6068	31.2759	29.9450	29.9450	31.2759	32.6068	33.9377	35.2686	36.5995	(42c)

Average daily hot water use (litres/day) 112.8757 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	122.7940	120.1723	116.9795	112.1239	108.1810	103.9421	102.3126	105.4917	108.8445	113.2948	118.2252	122.4754	(44)
Energy conte	194.4756	171.1238	179.7931	153.4920	145.6325	127.8089	123.7383	130.6207	134.2162	153.7399	168.4334	191.7669	(45)

Energy content (annual) Total = Sum(45)m = 1874.8415

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

29.1713	25.6686	26.9690	23.0238	21.8449	19.1713	18.5607	19.5931	20.1324	23.0610	25.2650	28.7650	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9720 (55)

Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

247.8700	219.3510	233.1875	205.1640	199.0269	179.4809	177.1327	184.0151	185.8882	207.1343	220.1054	245.1613	(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 -0.4925	-1.1051	-2.3416	-3.7688	-5.2137	-5.3335	-5.2624	-4.3030	-3.0022	-1.6377	-0.6738	-0.3830	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

247.3775	218.2459	230.8460	201.3952	193.8132	174.1474	171.8703	179.7122	182.8859	205.4967	219.4316	244.7784	(64)

Total per year (kWh/year) = Sum(64)m = 2470.0003 (64)

12Total per year (kWh/year) 2470 (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

107.3787	95.4804	102.4967	92.3737	91.1383	83.8341	83.8585	86.1469	85.9645	93.8340	97.3417	106.4780	(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	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.7172	104.8655	94.7172	97.8745	94.7172	97.8745	94.7172	94.7172	97.8745	94.7172	97.8745	94.7172	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.7875	189.7362	184.8256	174.3717	161.1755	148.7729	140.4872	138.5386	143.4491	153.9031	167.0993	179.5018	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	(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)	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	(71)
Water heating gains (Table 5)	144.3262	142.0840	137.7644	128.2968	122.4977	116.4362	112.7130	115.7889	119.3951	126.1210	135.1968	143.1156	(72)

Total internal gains

	482.0096	491.8643	472.4860	455.7217	433.5692	418.2623	403.0962	404.2234	415.8974	429.9200	455.3493	472.5134 (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	1.2000	10.6334	0.7600	0.7000	0.7700	4.7043 (74)
East	6.3000	19.6403	0.7600	0.7000	0.7700	45.6176 (76)
South	1.0000	46.7521	0.7600	0.7000	0.7700	17.2364 (78)
West	9.1300	19.6403	0.7600	0.7000	0.7700	66.1094 (80)

Solar gains	133.6677	255.7806	411.1750	590.1299	718.7525	734.7231	699.8545	603.4630	474.5553	300.4909	165.5448	110.6944 (83)
Total gains	615.6773	747.6450	883.6609	1045.8516	1152.3216	1152.9853	1102.9507	1007.6864	890.4527	730.4109	620.8940	583.2078 (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	66.7493	66.8278	66.9048	67.2692	67.3378	67.6591	67.6591	67.7189	67.5350	67.3378	67.1992	67.0548	
alpha	5.4500	5.4552	5.4603	5.4846	5.4892	5.5106	5.5106	5.5146	5.5023	5.4892	5.4799	5.4703	
util living area	0.9934	0.9812	0.9432	0.8261	0.6404	0.4527	0.3272	0.3736	0.6172	0.9053	0.9840	0.9950	(86)
Living	19.9355	20.1724	20.4927	20.8142	20.9594	20.9948	20.9993	20.9986	20.9749	20.7301	20.2628	19.8890	
Non living	18.6672	18.9658	19.3569	19.7181	19.8528	19.8823	19.8843	19.8850	19.8700	19.6445	19.0871	18.6116	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4554	20.1724	20.4927	20.8142	20.9594	20.9948	20.9993	20.9986	20.9749	20.7301	20.2628	20.0444	(87)
Th 2	19.8710	19.8722	19.8734	19.8788	19.8798	19.8845	19.8845	19.8853	19.8827	19.8798	19.8777	19.8756	(88)
util rest of house	0.9909	0.9743	0.9241	0.7799	0.5726	0.3754	0.2445	0.2837	0.5264	0.8652	0.9769	0.9931	(89)
MIT 2	19.3911	18.9658	19.3569	19.7181	19.8528	19.8823	19.8843	19.8850	19.8700	19.6445	19.0871	18.8394	(90)
Living area fraction										fLA = Living area / (4) =		0.3939	(91)
MIT	19.8104	19.4411	19.8043	20.1499	20.2887	20.3205	20.3235	20.3237	20.3053	20.0722	19.5502	19.3141	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8104	19.4411	19.8043	20.1499	20.2887	20.3205	20.3235	20.3237	20.3053	20.0722	19.5502	19.3141	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9907	0.9710	0.9227	0.7919	0.5980	0.4058	0.2771	0.3192	0.5617	0.8731	0.9742	0.9918	(94)
Useful gains	609.9449	725.9629	815.3451	828.1861	689.0909	467.9288	305.6825	321.6190	500.1704	637.7506	604.8777	578.4162	(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	1291.4670	1209.3403	1105.2050	929.4795	708.8881	469.9142	305.8709	322.0252	510.6724	781.8038	1029.7258	1252.7366	(97)
Space heating kWh	507.0525	324.8296	215.6558	72.9312	14.7291	0.0000	0.0000	0.0000	0.0000	107.1756	305.8906	501.6944	(98a)
Space heating requirement - total per year (kWh/year)												2049.9588	
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	507.0525	324.8296	215.6558	72.9312	14.7291	0.0000	0.0000	0.0000	0.0000	107.1756	305.8906	501.6944	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2049.9588	
Space heating per m2											(98c) / (4) =	31.0600	(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 %)	252.8487	(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	507.0525	324.8296	215.6558	72.9312	14.7291	0.0000	0.0000	0.0000	0.0000	107.1756	305.8906	501.6944	(98)
Space heating efficiency (main heating system 1)	252.8487	252.8487	252.8487	252.8487	252.8487	0.0000	0.0000	0.0000	0.0000	252.8487	252.8487	252.8487	(210)
Space heating fuel (main heating system)	200.5359	128.4680	85.2905	28.8438	5.8253	0.0000	0.0000	0.0000	0.0000	42.3872	120.9777	198.4168	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating
Water heating requirement

	247.3775	218.2459	230.8460	201.3952	193.8132	174.1474	171.8703	179.7122	182.8859	205.4967	219.4316	244.7784 (64)

Efficiency of water heater

												169.3820 (216)
(217)m	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820	169.3820 (217)

Fuel for water heating, kWh/month

	146.0472	128.8484	136.2872	118.9000	114.4238	102.8134	101.4691	106.0988	107.9725	121.3215	129.5484	144.5127 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	24.5155	19.6673	17.7082	12.9738	10.0213	8.1875	9.1418	11.8828	15.4346	20.2511	22.8736	25.1969 (232)

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

(233a)m	-5.4492	-8.7026	-14.1171	-17.8333	-21.0676	-20.3628	-20.0945	-17.9734	-14.5945	-10.6683	-6.3173	-4.5947 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

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

(233b)m	-0.0140	-0.0991	-0.3627	-0.8717	-1.4214	-1.5168	-1.4966	-1.2184	-0.8452	-0.3335	-0.0632	-0.0094 (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	810.7453 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	169.3820
Water heating fuel used	1458.2428 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	197.8544 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-170.0274 (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	2296.8152 (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	810.7453	0.1573	127.5595	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1458.2428	0.1410	205.6535	(264)
Space and water heating			333.2130	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	197.8544	0.1443	28.5565	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-161.7752	0.1322	-21.3929	
PV Unit electricity exported	-8.2522	0.1170	-0.9651	
Total			-22.3581	(269)
Total CO2, kg/year			339.4115	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.1400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	810.7453	1.5824	1282.9311	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1458.2428	1.5215	2218.6840	(278)
Space and water heating			3501.6150	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	197.8544	1.5338	303.4758	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-161.7752	1.4886	-240.8180	
PV Unit electricity exported	-8.2522	0.4289	-3.5397	
Total			-244.3577	(283)
Total Primary energy kWh/year			3560.7331	(286)
Dwelling Primary energy Rate (DPER)			53.9500	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	66.0000	(1b)	x 2.4000	(2b) =	158.4000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 66.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		158.4000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1263 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3763 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3480 (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	0.4438	0.4351	0.4264	0.3828	0.3741	0.3306	0.3306	0.3219	0.3480	0.3741	0.3915	0.4090	(22b)
Effective ac	0.5985	0.5946	0.5909	0.5733	0.5700	0.5547	0.5547	0.5518	0.5606	0.5700	0.5767	0.5836	(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 Opening Type (Uw = 1.20)			16.5000	1.1450	18.8931			(27)
Heatloss Floor 1			66.0000	0.1300	8.5800			(28a)
External Wall 1	81.6000	16.5000	65.1000	0.1800	11.7180			(29a)
External Roof 1	66.0000		66.0000	0.1100	7.2600			(30)
Total net area of external elements Aum(A, m2)			213.6000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.4511			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							303.1561	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E5	Ground floor (normal)	34.0000	0.1600	5.4400
E16	Corner (normal)	9.6000	0.0900	0.8640
E2	Other lintels (including other steel lintels)	11.2600	0.0500	0.5630
E3	Sill	4.7000	0.0500	0.2350
E4	Jamb	25.2000	0.0500	1.2600
E10	Eaves (insulation at ceiling level)	26.0000	0.0600	1.5600
E12	Gable (insulation at ceiling level)	8.0000	0.0600	0.4800

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.4020	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	56.8531	(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	31.2827	31.0828	30.8869	29.9668	29.7947	28.9933	28.9933	28.8449	29.3020	29.7947	30.1429	30.5070	(38)
Heat transfer coeff	88.1358	87.9359	87.7400	86.8199	86.6478	85.8464	85.8464	85.6980	86.1551	86.6478	86.9960	87.3601	(39)
Average = Sum(39)m / 12 =												86.8191	

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

HLP	1.3354	1.3324	1.3294	1.3155	1.3128	1.3007	1.3007	1.2985	1.3054	1.3128	1.3181	1.3236 (40)
HLP (average)												1.3154
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 2.1452 (42)

Hot water usage for mixer showers

60.1883	59.2838	57.9658	55.4439	53.5828	51.5074	50.3277	51.6358	53.0697	55.2981	57.8741	59.9577 (42a)

Hot water usage for baths

26.0062	25.6199	25.0761	24.0732	23.3223	22.4897	22.0399	22.5800	23.1681	24.0590	25.0825	25.9183 (42b)

Hot water usage for other uses

36.5995	35.2686	33.9377	32.6068	31.2759	29.9450	29.9450	31.2759	32.6068	33.9377	35.2686	36.5995 (42c)

Average daily hot water use (litres/day) 112.8757 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	122.7940	120.1723	116.9795	112.1239	108.1810	103.9421	102.3126	105.4917	108.8445	113.2948	118.2252	122.4754	(44)
Energy conte	194.4756	171.1238	179.7931	153.4920	145.6325	127.8089	123.7383	130.6207	134.2162	153.7399	168.4334	191.7669	(45)

Energy content (annual) Total = Sum(45)m = 1874.8415

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

29.1713	25.6686	26.9690	23.0238	21.8449	19.1713	18.5607	19.5931	20.1324	23.0610	25.2650	28.7650	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

241.0705	213.2095	226.3880	198.5839	192.2274	172.9007	170.3332	177.2156	179.3080	200.3348	213.5253	238.3618	(62)
WWHRS -27.5156	-24.3350	-25.4822	-21.1003	-19.6647	-16.8272	-15.7728	-16.7728	-17.4101	-20.5246	-23.2519	-27.0060	(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

213.5549	188.8745	200.9058	177.4836	172.5627	156.0735	154.5603	160.4428	161.8979	179.8102	190.2734	211.3558	(64)

Total per year (kWh/year) = Sum(64)m = 2167.7955 (64)

12Total per year (kWh/year) 2168 (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

101.9391	90.5672	97.0571	87.1096	85.6987	78.5699	78.4189	80.7073	80.7004	88.3945	92.0776	101.0384	(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	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	107.2623	(66)

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

94.7172	104.8655	94.7172	97.8745	94.7172	97.8745	94.7172	94.7172	97.8745	94.7172	97.8745	94.7172	(67)

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

187.7875	189.7362	184.8256	174.3717	161.1755	148.7729	140.4872	138.5386	143.4491	153.9031	167.0993	179.5018	(68)

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

33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	33.7262	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	-85.8098	(71)

Water heating gains (Table 5)

137.0149	134.7727	130.4531	120.9855	115.1865	109.1249	105.4017	108.4776	112.0838	118.8097	127.8855	135.8043	(72)

Total internal gains

477.6983	487.5530	468.1747	451.4104	429.2579	410.9510	395.7849	396.9121	408.5861	425.6087	451.0380	468.2021	(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	1.1200	10.6334	0.6300	0.7000	0.7700	3.6397	(74)
East	5.9000	19.6403	0.6300	0.7000	0.7700	35.4137	(76)
South	0.9400	46.7521	0.6300	0.7000	0.7700	13.4308	(78)
West	8.5400	19.6403	0.6300	0.7000	0.7700	51.2598	(80)

Solar gains	103.7439	198.5035	319.0660	457.8893	557.6579	570.0369	542.9889	468.2223	368.2331	233.1920	128.4817	85.9157	(83)
Total gains	581.4422	686.0565	787.2407	909.2996	986.9158	980.9879	938.7738	865.1344	776.8192	658.8008	579.5197	554.1178	(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	63.0602	63.2035	63.3446	64.0160	64.1431	64.7419	64.7419	64.8540	64.5100	64.1431	63.8864	63.6201	
alpha	5.2040	5.2136	5.2230	5.2677	5.2762	5.3161	5.3161	5.3236	5.3007	5.2762	5.2591	5.2413	
util living area	0.9952	0.9881	0.9673	0.8945	0.7451	0.5485	0.4005	0.4519	0.7119	0.9401	0.9890	0.9962	(86)
MIT	19.7929	20.0023	20.3091	20.6785	20.9044	20.9845	20.9976	20.9955	20.9437	20.6179	20.1381	19.7604	(87)
Th 2	19.8132	19.8156	19.8179	19.8287	19.8308	19.8403	19.8403	19.8420	19.8366	19.8308	19.8267	19.8224	(88)
util rest of house	0.9933	0.9834	0.9546	0.8578	0.6746	0.4546	0.2960	0.3402	0.6139	0.9100	0.9839	0.9947	(89)
MIT 2	18.4437	18.7106	19.0941	19.5351	19.7634	19.8335	19.8398	19.8409	19.8064	19.4822	18.8930	18.4090	(90)
Living area fraction									fLA = Living area / (4) =			0.3939	(91)
MIT	18.9752	19.2195	19.5728	19.9855	20.2129	20.2869	20.2959	20.2958	20.2544	19.9296	19.3835	18.9414	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9752	19.2195	19.5728	19.9855	20.2129	20.2869	20.2959	20.2958	20.2544	19.9296	19.3835	18.9414	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9804	0.9514	0.8633	0.6990	0.4915	0.3373	0.3844	0.6511	0.9131	0.9813	0.9931	(94)
Useful gains	576.4154	672.5783	748.9837	785.0220	689.8414	482.1249	316.6184	332.5678	505.7978	601.5304	568.6667	550.2994	(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	1293.4098	1259.1948	1147.0060	962.4422	737.6240	488.2035	317.2764	333.8603	530.2331	808.3890	1068.6174	1287.8079	(97)
Space heating kWh	533.4438	394.2062	296.1286	127.7425	35.5502	0.0000	0.0000	0.0000	0.0000	153.9028	359.9645	548.7064	(98a)
Space heating requirement - total per year (kWh/year)												2449.6452	
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	533.4438	394.2062	296.1286	127.7425	35.5502	0.0000	0.0000	0.0000	0.0000	153.9028	359.9645	548.7064	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2449.6452	
Space heating per m2											(98c) / (4) =	37.1158	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.3000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	533.4438	394.2062	296.1286	127.7425	35.5502	0.0000	0.0000	0.0000	0.0000	153.9028	359.9645	548.7064	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	577.9456	427.0924	320.8328	138.3992	38.5160	0.0000	0.0000	0.0000	0.0000	166.7420	389.9941	594.4814	(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	213.5549	188.8745	200.9058	177.4836	172.5627	156.0735	154.5603	160.4428	161.8979	179.8102	190.2734	211.3558	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0263	85.6702	84.9283	83.3348	81.2059	79.8000	79.8000	79.8000	79.8000	83.7129	85.4668	86.0997	(217)
Fuel for water heating, kWh/month	248.2438	220.4669	236.5592	212.9765	212.5001	195.5808	193.6846	201.0561	202.8796	214.7940	222.6285	245.4779	(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	19.6804	15.7883	14.2156	10.4150	8.0448	6.5727	7.3388	9.5392	12.3905	16.2570	18.3622	20.2273	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-51.5199	-67.9918	-91.5996	-96.3844	-98.7661	-90.4691	-89.3652	-86.8004	-81.6567	-74.4705	-54.9730	-45.1116	(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	-45.1171	-92.4572	-179.4222	-263.4496	-342.7306	-342.3148	-338.2415	-288.8571	-215.1179	-130.0422	-59.4945	-35.8624	(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	2654.0035 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2606.8482 (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)	158.8319 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3262.2154 (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	2243.4682 (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	2654.0035	0.2100	557.3407	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2606.8482	0.2100	547.4381	(264)
Space and water heating			1104.7788	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	158.8319	0.1443	22.9243	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.1082	0.1360	-126.3529	
PV Unit electricity exported	-2333.1071	0.1266	-295.3243	
Total			-421.6773	(269)
Total CO2, kg/year			717.9552	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8800	(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	2654.0035	1.1300	2999.0239	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2606.8482	1.1300	2945.7384	(278)
Space and water heating			5944.7624	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	158.8319	1.5338	243.6216	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.1082	1.5027	-1396.1582	
PV Unit electricity exported	-2333.1071	0.4647	-1084.1147	
Total			-2480.2729	(283)
Total Primary energy kWh/year			3838.2119	(286)
Target Primary Energy Rate (TPER)			58.1500	(287)

Full SAP Calculation Printout

Property Reference	House Type T	Issued on Date	05/10/2023
Assessment Reference	Plot 4	Prop Type Ref	
Property			

SAP Rating	82 B	DER	4.18	TER	9.87
Environmental	96 A	% DER < TER			57.65
CO_2 Emissions (t/year)	0.38	DFEE	29.66	TFEE	35.65
Compliance Check	See BREL	% DFEE < TFEE			16.79
% DPER < TPER	14.12	DPER	44.06	TPER	51.31

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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		51.0000 (1b)	x	2.4000 (2b)	=	122.4000 (1b)	-
First floor		48.0000 (1c)	x	2.4000 (2c)	=	115.2000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.6000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0421	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2421	(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) =	0.2058	(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	0.2624	0.2572	0.2521	0.2264	0.2212	0.1955	0.1955	0.1903	0.2058	0.2212	0.2315	0.2418	(22b)
Effective ac	0.5344	0.5331	0.5318	0.5256	0.5245	0.5191	0.5191	0.5181	0.5212	0.5245	0.5268	0.5292	(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	
Opening Type 1 (Uw = 1.20)			23.3000	1.1450	26.6794			(27)
Heatloss Floor 1			51.0000	0.1200	6.1200	110.0000	5610.0000	(28a)
External Wall 1	86.4000	23.3000	63.1000	0.1900	11.9890	190.0000	11989.0000	(29a)
External Roof 1	48.0000		48.0000	0.1500	7.2000	9.0000	432.0000	(30)
Total net area of external elements Aum(A, m2)			185.4000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.9884			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18031.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 182.1313 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	46.0000	0.0670	3.0820
E6 Intermediate floor within a dwelling	66.0000	0.0020	0.1320
E16 Corner (normal)	28.8000	0.0410	1.1808
E18 Party wall between dwellings	9.6000	0.0400	0.3840
E2 Other lintels (including other steel lintels)	25.0000	0.0240	0.6000
E3 Sill	20.0000	0.0190	0.3800
E4 Jamb	60.0000	0.0140	0.8400
E11 Eaves (insulation at rafter level)	8.2000	0.0110	0.0902
E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960
E10 Eaves (insulation at ceiling level)	20.0000	0.0460	0.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.0050 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 59.9934 (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	41.9026	41.7978	41.6951	41.2126	41.1224	40.7022	40.7022	40.6244	40.8640	41.1224	41.3050	41.4959	(38)
Heat transfer coeff	101.8960	101.7912	101.6885	101.2060	101.1157	100.6956	100.6956	100.6177	100.8574	101.1157	101.2984	101.4893	(39)

Average = Sum(39)m / 12 = 101.2056

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0293	1.0282	1.0272	1.0223	1.0214	1.0171	1.0171	1.0163	1.0188	1.0214	1.0232	1.0251	(40)
HLP (average)												1.0223	
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 2.7301 (42)
Hot water usage for mixer showers

69.9941	68.9423	67.4095	64.4768	62.3125	59.8989	58.5270	60.0482	61.7157	64.3072	67.3029	69.7260	(42a)

Hot water usage for baths

30.2230	29.7741	29.1421	27.9766	27.1039	26.1363	25.6136	26.2413	26.9247	27.9601	29.1495	30.1208	(42b)

Hot water usage for other uses

42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887	(42c)

Average daily hot water use (litres/day) 131.2707 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	142.8058	139.7564	136.0429	130.3960	125.8104	120.8805	118.9860	122.6835	126.5831	131.7586	137.4924	142.4355	(44)
Energy conte	226.1695	199.0113	209.0928	178.5056	169.3650	148.6367	143.9032	151.9078	156.0896	178.7952	195.8832	223.0195	(45)

Energy content (annual) Total = Sum(45)m = 2180.3794
Distribution loss (46)m = 0.15 x (45)m

33.9254	29.8517	31.3639	26.7758	25.4047	22.2955	21.5855	22.7862	23.4134	26.8193	29.3825	33.4529	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

279.5639	247.2385	262.4872	230.1776	222.7594	200.3087	197.2976	205.3022	207.7616	232.1896	247.5552	276.4139	(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													
279.5639	247.2385	262.4872	230.1776	222.7594	200.3087	197.2976	205.3022	207.7616	232.1896	247.5552	276.4139	(64)

Total per year (kWh/year) = Sum(64)m = 2809.0554 (64)
12Total per year (kWh/year) 2809 (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

117.9169	104.7530	112.2389	100.6907	99.0294	90.7593	90.5633	93.2249	93.2374	102.1649	106.4688	116.8695	(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	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	128.4674	142.2317	128.4674	132.7496	128.4674	132.7496	128.4674	128.4674	132.7496	128.4674	132.7496	128.4674	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	(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)													

	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)
Water heating gains (Table 5)												
	158.4904	155.8825	150.8587	139.8482	133.1040	126.0546	121.7249	125.3022	129.4964	137.3184	147.8733	157.0827 (72)
Total internal gains												
	605.6098	619.4092	593.9608	573.0537	544.1288	524.5397	504.6897	505.6241	520.7607	538.4795	571.2149	592.9640 (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	
East	12.2000	19.6403	0.7600	0.7000	0.7700	88.3389	(76)
South	9.3000	46.7521	0.7600	0.7000	0.7700	160.2982	(78)
West	1.8000	19.6403	0.7600	0.7000	0.7700	13.0336	(80)

Solar gains	261.6707	460.8333	660.9950	854.2596	977.5809	976.5790	939.2265	848.3164	729.1622	518.4671	316.4076	221.8762 (83)
Total gains	867.2805	1080.2425	1254.9558	1427.3133	1521.7097	1501.1188	1443.9163	1353.9405	1249.9229	1056.9466	887.6225	814.8402 (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	49.1542	49.2048	49.2545	49.4893	49.5334	49.7401	49.7401	49.7786	49.6603	49.5334	49.4442	49.3511	
alpha	4.2769	4.2803	4.2836	4.2993	4.3022	4.3160	4.3160	4.3186	4.3107	4.3022	4.2963	4.2901	
util living area													
	0.9717	0.9356	0.8698	0.7445	0.5857	0.4229	0.3055	0.3397	0.5361	0.8093	0.9442	0.9776	(86)
Living	19.7818	20.1088	20.4566	20.7699	20.9302	20.9862	20.9973	20.9958	20.9632	20.7212	20.1905	19.7102	
Non living	18.6607	19.0660	19.4850	19.8434	20.0082	20.0606	20.0680	20.0679	20.0428	19.8026	19.1768	18.5734	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.3768	20.1088	20.4566	20.7699	20.9302	20.9862	20.9973	20.9958	20.9632	20.7212	20.1905	19.8906	(87)
Th 2	20.0590	20.0599	20.0608	20.0648	20.0656	20.0691	20.0691	20.0697	20.0677	20.0656	20.0640	20.0624	(88)
util rest of house													
	0.9657	0.9231	0.8469	0.7066	0.5352	0.3638	0.2415	0.2720	0.4706	0.7691	0.9311	0.9727	(89)
MIT 2	19.5016	19.0660	19.4850	19.8434	20.0082	20.0606	20.0680	20.0679	20.0428	19.8026	19.1768	18.8417	(90)
Living area fraction									fLA = Living area / (4) =			0.2626	(91)
MIT	19.7314	19.3399	19.7402	20.0868	20.2504	20.3037	20.3121	20.3116	20.2845	20.0438	19.4430	19.1172	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7314	19.3399	19.7402	20.0868	20.2504	20.3037	20.3121	20.3116	20.2845	20.0438	19.4430	19.1172	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9632	0.9117	0.8381	0.7075	0.5455	0.3788	0.2583	0.2897	0.4862	0.7681	0.9205	0.9664	(94)
Useful gains	835.3723	984.8569	1051.7725	1009.8589	830.0593	568.6972	372.9783	392.2315	607.7415	811.8237	817.0370	787.4226	(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													
	1572.4001	1469.8514	1346.3705	1132.1664	864.5768	574.3405	373.7906	393.5782	623.7567	954.9217	1250.3294	1513.9347	(97)
Space heating kWh													
	548.3487	325.9163	219.1809	88.0614	25.6810	0.0000	0.0000	0.0000	0.0000	106.4649	311.9705	540.5250	(98a)
Space heating requirement - total per year (kWh/year)												2166.1488	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	548.3487	325.9163	219.1809	88.0614	25.6810	0.0000	0.0000	0.0000	0.0000	106.4649	311.9705	540.5250	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2166.1488	
Space heating per m2											(98c) / (4) =	21.8803	(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 %)	255.5442	(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													
	548.3487	325.9163	219.1809	88.0614	25.6810	0.0000	0.0000	0.0000	0.0000	106.4649	311.9705	540.5250	(98)
Space heating efficiency (main heating system 1)													
	255.5442	255.5442	255.5442	255.5442	255.5442	0.0000	0.0000	0.0000	0.0000	255.5442	255.5442	255.5442	(210)
Space heating fuel (main heating system)													
	214.5807	127.5381	85.7702	34.4603	10.0495	0.0000	0.0000	0.0000	0.0000	41.6620	122.0808	211.5191	(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

279.5639	247.2385	262.4872	230.1776	222.7594	200.3087	197.2976	205.3022	207.7616	232.1896	247.5552	276.4139 (64)

Efficiency of water heater

											164.5836 (216)
(217)m	164.5836	164.5836	164.5836	164.5836	164.5836	164.5836	164.5836	164.5836	164.5836	164.5836	164.5836 (217)

Fuel for water heating, kWh/month

169.8613	150.2206	159.4856	139.8545	135.3472	121.7063	119.8768	124.7403	126.2347	141.0770	150.4130	167.9474 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	34.3173	27.5306	24.7883	18.1610	14.0281	11.4610	12.7969	16.6338	21.6057	28.3479	32.0188	35.2711 (232)

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

(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

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

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	847.6610 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	164.5836
Water heating fuel used	1706.7648 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	276.9606 (232)

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

PV generation	0.0000 (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	2831.3864 (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	847.6610	0.1573	133.3378	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1706.7648	0.1409	240.5459	(264)
Space and water heating			373.8838	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	276.9606	0.1443	39.9740	(268)
Total CO2, kg/year			413.8577	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1800	(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	847.6610	1.5823	1341.2206	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1706.7648	1.5211	2596.2196	(278)
Space and water heating			3937.4402	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	276.9606	1.5338	424.8113	(282)
Total Primary energy kWh/year			4362.2515	(286)
Dwelling Primary energy Rate (DPER)			44.0600	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.0000 (1b)	x	2.4000 (2b)	=	122.4000 (1b)	-
First floor	48.0000 (1c)	x	2.4000 (2c)	=	115.2000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		237.6000	(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) =	0.1263 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3763 (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) =	0.3198 (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	0.4078	0.3998	0.3918	0.3518	0.3438	0.3038	0.3038	0.2958	0.3198	0.3438	0.3598	0.3758	(22b)
Effective ac	0.5831	0.5799	0.5767	0.5619	0.5591	0.5462	0.5462	0.5438	0.5511	0.5591	0.5647	0.5706	(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 Opening Type (Uw = 1.20)			23.3000	1.1450	26.6794			(27)
Heatloss Floor 1			51.0000	0.1300	6.6300			(28a)
External Wall 1	86.4000	23.3000	63.1000	0.1800	11.3580			(29a)
External Roof 1	48.0000		48.0000	0.1100	5.2800			(30)
Total net area of external elements Aum(A, m2)			185.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.9474			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 182.1313 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	46.0000	0.1600	7.3600
E6 Intermediate floor within a dwelling	66.0000	0.0000	0.0000
E16 Corner (normal)	28.8000	0.0900	2.5920
E18 Party wall between dwellings	9.6000	0.0600	0.5760
E2 Other lintels (including other steel lintels)	25.0000	0.0500	1.2500
E3 Sill	20.0000	0.0500	1.0000
E4 Jamb	60.0000	0.0500	3.0000
E11 Eaves (insulation at rafter level)	8.2000	0.0400	0.3280
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200
E10 Eaves (insulation at ceiling level)	20.0000	0.0600	1.2000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 18.0260 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 67.9734 (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	45.7228	45.4697	45.2216	44.0562	43.8381	42.8231	42.8231	42.6351	43.2141	43.8381	44.2792	44.7404	(38)
Heat transfer coeff	113.6962	113.4431	113.1950	112.0296	111.8115	110.7965	110.7965	110.6085	111.1874	111.8115	112.2526	112.7138	(39)
Average = Sum(39)m / 12 =												112.0285	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1484	1.1459	1.1434	1.1316	1.1294	1.1192	1.1192	1.1173	1.1231	1.1294	1.1339	1.1385	(40)
HLP (average)												1.1316	
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												2.7301 (42)
Hot water usage for mixer showers												
	69.9941	68.9423	67.4095	64.4768	62.3125	59.8989	58.5270	60.0482	61.7157	64.3072	67.3029	69.7260 (42a)
Hot water usage for baths												
	30.2230	29.7741	29.1421	27.9766	27.1039	26.1363	25.6136	26.2413	26.9247	27.9601	29.1495	30.1208 (42b)
Hot water usage for other uses												
	42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887 (42c)
Average daily hot water use (litres/day)												131.2707 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	142.8058	139.7564	136.0429	130.3960	125.8104	120.8805	118.9860	122.6835	126.5831	131.7586	137.4924	142.4355	(44)
Energy conte	226.1695	199.0113	209.0928	178.5056	169.3650	148.6367	143.9032	151.9078	156.0896	178.7952	195.8832	223.0195	(45)
Energy content (annual)										Total = Sum(45)m =		2180.3794	
Distribution loss (46)m = 0.15 x (45)m													
	33.9254	29.8517	31.3639	26.7758	25.4047	22.2955	21.5855	22.7862	23.4134	26.8193	29.3825	33.4529	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	272.7644	241.0970	255.6877	223.5975	215.9599	193.7285	190.4981	198.5027	201.1814	225.3901	240.9750	269.6144	(62)
WWHRS	-31.9984	-28.2996	-29.6338	-24.5379	-22.8685	-19.5687	-18.3425	-19.5055	-20.2465	-23.8684	-27.0400	-31.4058	(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													
	240.7660	212.7973	226.0540	199.0596	193.0914	174.1598	172.1556	178.9972	180.9349	201.5217	213.9350	238.2086	(64)
									Total per year (kWh/year) = Sum(64)m =			2431.6811	(64)
12Total per year (kWh/year)												2432	(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													
	112.4773	99.8398	106.7993	95.4266	93.5898	85.4952	85.1237	87.7853	87.9733	96.7253	101.2046	111.4299	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	128.4674	142.2317	128.4674	132.7496	128.4674	132.7496	128.4674	128.4674	132.7496	128.4674	132.7496	128.4674	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	(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)													
	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)
Water heating gains (Table 5)													
	151.1792	148.5712	143.5474	132.5369	125.7927	118.7433	114.4136	117.9909	122.1851	130.0072	140.5620	149.7714	(72)
Total internal gains													
	601.2985	615.0979	589.6495	568.7424	539.8176	517.2284	497.3785	498.3128	513.4494	534.1682	566.9036	588.6527	(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	
East	12.2000	19.6403	0.6300	0.7000	0.7700	73.2283	(76)
South	9.3000	46.7521	0.6300	0.7000	0.7700	132.8788	(78)
West	1.8000	19.6403	0.6300	0.7000	0.7700	10.8042	(80)

Solar gains	216.9112	382.0065	547.9300	708.1363	810.3631	809.5326	778.5694	703.2097	604.4371	429.7819	262.2853	183.9237	(83)
Total gains	818.2098	997.1044	1137.5796	1276.8786	1350.1807	1326.7611	1275.9478	1201.5225	1117.8865	963.9501	829.1889	772.5764	(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	44.0526	44.1509	44.2476	44.7079	44.7951	45.2055	45.2055	45.2823	45.0466	44.7951	44.6191	44.4365	
alpha	3.9368	3.9434	3.9498	3.9805	3.9863	4.0137	4.0137	4.0188	4.0031	3.9863	3.9746	3.9624	
util living area													
	0.9790	0.9561	0.9138	0.8224	0.6843	0.5134	0.3771	0.4156	0.6300	0.8667	0.9603	0.9828	(86)
MIT	19.4861	19.7951	20.1691	20.5770	20.8394	20.9612	20.9911	20.9869	20.9127	20.5465	19.9427	19.4320	(87)
Th 2	19.9615	19.9635	19.9656	19.9751	19.9769	19.9852	19.9852	19.9868	19.9820	19.9769	19.9733	19.9695	(88)
util rest of house													
	0.9741	0.9465	0.8956	0.7876	0.6290	0.4395	0.2924	0.3276	0.5546	0.8316	0.9500	0.9788	(89)
MIT 2	18.2207	18.6087	19.0701	19.5574	19.8415	19.9611	19.9817	19.9812	19.9214	19.5381	18.8060	18.1581	(90)
Living area fraction											fLA = Living area / (4) =	0.2626	(91)
MIT	18.5530	18.9203	19.3587	19.8252	20.1036	20.2238	20.2468	20.2454	20.1817	19.8029	19.1045	18.4926	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5530	18.9203	19.3587	19.8252	20.1036	20.2238	20.2468	20.2454	20.1817	19.8029	19.1045	18.4926	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9652	0.9343	0.8829	0.7820	0.6363	0.4574	0.3145	0.3505	0.5701	0.8247	0.9387	0.9709	(94)
Useful gains	789.7467	931.5897	1004.3863	998.4599	859.0528	606.8159	401.3150	421.0745	637.3542	794.9402	778.3531	750.1285	(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													
	1620.5178	1590.5030	1455.5387	1223.9452	939.6163	623.0941	404.0568	425.3287	676.2110	1028.9915	1347.5394	1610.9762	(97)
Space heating kWh													
	618.0937	442.7897	335.6574	162.3494	59.9392	0.0000	0.0000	0.0000	0.0000	174.1342	409.8141	640.4707	(98a)
Space heating requirement - total per year (kWh/year)												2843.2485	
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													
	618.0937	442.7897	335.6574	162.3494	59.9392	0.0000	0.0000	0.0000	0.0000	174.1342	409.8141	640.4707	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2843.2485	
Space heating per m2											(98c) / (4) =	28.7197	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	618.0937	442.7897	335.6574	162.3494	59.9392	0.0000	0.0000	0.0000	0.0000	174.1342	409.8141	640.4707	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	669.6573	479.7288	363.6591	175.8932	64.9396	0.0000	0.0000	0.0000	0.0000	188.6611	444.0023	693.9011	(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													
	240.7660	212.7973	226.0540	199.0596	193.0914	174.1598	172.1556	178.9972	180.9349	201.5217	213.9350	238.2086	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0785	85.6640	84.9446	83.6065	81.7630	79.8000	79.8000	79.8000	79.8000	83.7339	85.4929	86.1655	(217)
Fuel for water heating, kWh/month													
	279.7052	248.4093	266.1194	238.0911	236.1599	218.2454	215.7338	224.3073	226.7354	240.6691	250.2370	276.4548	(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	26.6930	21.4141	19.2810	14.1261	10.9114	8.9147	9.9538	12.9383	16.8055	22.0498	24.9052	27.4349	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-46.3462	-64.6534	-91.9656	-102.2788	-109.3270	-101.6637	-100.3504	-95.1619	-85.9229	-73.3366	-50.6846	-40.1453	(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	-28.3279	-59.3299	-117.4603	-175.7747	-231.8296	-232.7602	-230.0729	-195.1189	-143.4029	-84.6959	-37.7676	-22.4256	(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												3080.4426	(211)

Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2920.8676 (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)	215.4276 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2520.8028 (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	3781.9351 (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	3080.4426	0.2100	646.8929	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2920.8676	0.2100	613.3822	(264)
Space and water heating			1260.2751	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	215.4276	0.1443	31.0929	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-961.8364	0.1348	-129.6768	
PV Unit electricity exported	-1558.9664	0.1260	-196.4283	
Total			-326.1052	(269)
Total CO2, kg/year			977.1921	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.8700	(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	3080.4426	1.1300	3480.9001	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2920.8676	1.1300	3300.5804	(278)
Space and water heating			6781.4805	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	215.4276	1.5338	330.4301	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-961.8364	1.4983	-1441.1127	
PV Unit electricity exported	-1558.9664	0.4625	-721.0338	
Total			-2162.1465	(283)
Total Primary energy kWh/year			5079.8650	(286)
Target Primary Energy Rate (TPER)			51.3100	(287)

Full SAP Calculation Printout

Property Reference	House Type T	Issued on Date	05/10/2023
Assessment Reference	Plot 5	Prop Type Ref	
Property			

SAP Rating	81 B	DER	5.62	TER	15.89
Environmental	96 A	% DER < TER			64.63
CO_2 Emissions (t/year)	0.26	DFEE	39.70	TFEE	47.40
Compliance Check	See BREL	% DFEE < TFEE			16.24
% DPER < TPER	29.25	DPER	59.26	TPER	83.76

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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		50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	120.0000	(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	1 * 10 =	10.0000 (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) =	10.0000 / (5) =	0.0833 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2833 (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) =	0.2408 (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	0.3071	0.3010	0.2950	0.2649	0.2589	0.2288	0.2288	0.2228	0.2408	0.2589	0.2709	0.2830	(22b)
Effective ac	0.5471	0.5453	0.5435	0.5351	0.5335	0.5262	0.5262	0.5248	0.5290	0.5335	0.5367	0.5400	(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	
Opening Type 1 (Uw = 1.20)			20.6000	1.1450	23.5878			(27)
Heatloss Floor 1			50.0000	0.1200	6.0000	110.0000	5500.0000	(28a)
External Wall 1	45.0000	20.6000	24.4000	0.1900	4.6360	190.0000	4636.0000	(29a)
Total net area of external elements Aum(A, m2)			95.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.2238			(33)
Party Ceiling 1			50.0000			30.0000	1500.0000	(32b)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11636.0000	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 232.7200 (35)
List of Thermal Bridges

	Length	Psi-value	Total
E5 Ground floor (normal)	46.0000	0.0670	3.0820
E6 Intermediate floor within a dwelling	66.0000	0.0020	0.1320
E16 Corner (normal)	28.8000	0.0410	1.1808
E18 Party wall between dwellings	9.6000	0.0400	0.3840
E2 Other lintels (including other steel lintels)	25.0000	0.0240	0.6000
E3 Sill	20.0000	0.0190	0.3800
E4 Jamb	60.0000	0.0140	0.8400
E11 Eaves (insulation at rafter level)	8.2000	0.0110	0.0902
E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960
E10 Eaves (insulation at ceiling level)	20.0000	0.0460	0.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.0050 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 42.2288 (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	21.6669	21.5944	21.5233	21.1896	21.1271	20.8364	20.8364	20.7826	20.9484	21.1271	21.2535	21.3855	(38)
Heat transfer coeff	63.8957	63.8232	63.7521	63.4184	63.3559	63.0652	63.0652	63.0114	63.1772	63.3559	63.4822	63.6143	(39)

Average = Sum(39)m / 12 = 63.4181

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2779	1.2765	1.2750	1.2684	1.2671	1.2613	1.2613	1.2602	1.2635	1.2671	1.2696	1.2723	(40)
HLP (average)												1.2684	
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 1.6901 (42)
Hot water usage for mixer showers

52.5569	51.7671	50.6162	48.4141	46.7890	44.9767	43.9465	45.0888	46.3409	48.2867	50.5361	52.3556	(42a)

Hot water usage for baths

22.7244	22.3869	21.9117	21.0354	20.3792	19.6517	19.2587	19.7306	20.2445	21.0230	21.9173	22.6476	(42b)

Hot water usage for other uses

31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383	(42c)

Average daily hot water use (litres/day) 98.5597 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.2197	104.9310	102.1434	97.9036	94.4609	90.7597	89.3366	92.1121	95.0395	98.9252	103.2304	106.9415	(44)
Energy conte	169.8097	149.4203	156.9906	134.0251	127.1626	111.5996	108.0448	114.0541	117.1932	134.2406	147.0706	167.4445	(45)

Energy content (annual) Total = Sum(45)m = 1637.0557

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

25.4715	22.4130	23.5486	20.1038	19.0744	16.7399	16.2067	17.1081	17.5790	20.1361	22.0606	25.1167	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
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)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

223.2041	197.6475	210.3850	185.6971	180.5570	163.2716	161.4392	167.4485	168.8652	187.6350	198.7426	220.8389	(62)
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)
-0.1056	-0.2389	-0.5100	-0.8273	-1.1503	-1.1784	-1.1621	-0.9465	-0.6568	-0.3552	-0.1449	-0.0820	(63b)
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)
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)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

223.0985	197.4086	209.8749	184.8699	179.4067	162.0933	160.2772	166.5020	168.2083	187.2798	198.5977	220.7570	(64)

Total per year (kWh/year) = Sum(64)m = 2258.3739 (64)
12Total per year (kWh/year) 2258 (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

99.1773	88.2640	94.9149	85.9010	84.9971	78.4445	78.6404	80.6385	80.3043	87.3505	90.2386	98.3908	(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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)

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

74.2626	82.2193	74.2626	76.7380	74.2626	76.7380	74.2626	74.2626	76.7380	74.2626	76.7380	74.2626	(67)

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

147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)

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

31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(69)
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)

Pumps, fans
Losses e.g. evaporation (negative values) (Table 5)

-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)

Water heating gains (Table 5)

	133.3028	131.3452	127.5738	119.3069	114.2434	108.9507	105.6995	108.3851	111.5338	117.4066	125.3313	132.2457 (72)

Total internal gains

	403.1508	410.6779	395.0996	381.1118	363.2264	350.6849	338.4620	339.6197	349.0940	360.6877	381.4343	395.5974 (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	5.3000	10.6334	0.7600	0.7000	0.7700	20.7775 (74)
East	5.8000	19.6403	0.7600	0.7000	0.7700	41.9972 (76)
West	9.5000	19.6403	0.7600	0.7000	0.7700	68.7885 (80)

Solar gains	131.5631	256.4271	424.3790	628.9048	783.9201	809.3218	767.6295	649.8084	496.2208	304.4226	163.7684	108.4259 (83)
Total gains	534.7140	667.1049	819.4786	1010.0166	1147.1465	1160.0067	1106.0916	989.4282	845.3148	665.1104	545.2027	504.0233 (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	50.5859	50.6434	50.6998	50.9667	51.0169	51.2520	51.2520	51.2958	51.1612	51.0169	50.9154	50.8097	
alpha	4.3724	4.3762	4.3800	4.3978	4.4011	4.4168	4.4168	4.4197	4.4107	4.4011	4.3944	4.3873	
util living area	0.9751	0.9413	0.8596	0.6892	0.4999	0.3458	0.2505	0.2920	0.5019	0.8110	0.9502	0.9801	(86)
Living	19.7922	20.1153	20.5129	20.8421	20.9652	20.9945	20.9990	20.9980	20.9740	20.7350	20.1924	19.7266	
Non living	18.5051	18.9030	19.3717	19.7279	19.8420	19.8686	19.8710	19.8715	19.8549	19.6358	19.0097	18.4263	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.3822	20.1153	20.5129	20.8421	20.9652	20.9945	20.9990	20.9980	20.9740	20.7350	20.1924	19.9047	(87)
Th 2	19.8582	19.8593	19.8604	19.8657	19.8667	19.8713	19.8713	19.8721	19.8695	19.8667	19.8647	19.8626	(88)
util rest of house	0.9682	0.9266	0.8295	0.6406	0.4435	0.2858	0.1864	0.2209	0.4251	0.7608	0.9350	0.9745	(89)
MIT 2	19.3188	18.9030	19.3717	19.7279	19.8420	19.8686	19.8710	19.8715	19.8549	19.6358	19.0097	18.6851	(90)
Living area fraction										fLA = Living area / (4) =		0.3800	(91)
MIT	19.7229	19.3636	19.8053	20.1513	20.2688	20.2964	20.2996	20.2996	20.2802	20.0535	19.4591	19.1486	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7229	19.3636	19.8053	20.1513	20.2688	20.2964	20.2996	20.2996	20.2802	20.0535	19.4591	19.1486	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9672	0.9189	0.8279	0.6533	0.4638	0.3085	0.2108	0.2479	0.4535	0.7698	0.9283	0.9700	(94)
Useful gains	517.1729	613.0143	678.4387	659.8779	532.0709	357.8431	233.1267	245.3257	383.3744	512.0087	506.1162	488.9096	(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	985.4535	923.1160	848.2435	713.5386	542.8864	359.2450	233.3173	245.7174	390.4458	598.9365	784.5842	950.9430	(97)
Space heating kWh	348.4008	208.3884	126.3348	38.6357	8.0468	0.0000	0.0000	0.0000	0.0000	64.6743	200.4970	343.7528	(98a)
Space heating requirement - total per year (kWh/year)												1338.7305	
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	348.4008	208.3884	126.3348	38.6357	8.0468	0.0000	0.0000	0.0000	0.0000	64.6743	200.4970	343.7528	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1338.7305	
Space heating per m2											(98c) / (4) =	26.7746	(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 %) 253.5154 (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	348.4008	208.3884	126.3348	38.6357	8.0468	0.0000	0.0000	0.0000	0.0000	64.6743	200.4970	343.7528	(98)
Space heating efficiency (main heating system 1)	253.5154	253.5154	253.5154	253.5154	253.5154	0.0000	0.0000	0.0000	0.0000	253.5154	253.5154	253.5154	(210)
Space heating fuel (main heating system)	137.4279	82.1995	49.8332	15.2400	3.1741	0.0000	0.0000	0.0000	0.0000	25.5110	79.0867	135.5945	(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												
	223.0985	197.4086	209.8749	184.8699	179.4067	162.0933	160.2772	166.5020	168.2083	187.2798	198.5977	220.7570 (64)
Efficiency of water heater												173.0522 (216)
(217)m	173.0522	173.0522	173.0522	173.0522	173.0522	173.0522	173.0522	173.0522	173.0522	173.0522	173.0522	173.0522 (217)
Fuel for water heating, kWh/month												
	128.9198	114.0746	121.2784	106.8289	103.6720	93.6673	92.6178	96.2149	97.2009	108.2216	114.7617	127.5667 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	18.6296	14.9453	13.4566	9.8589	7.6153	6.2218	6.9469	9.0299	11.7289	15.3890	17.3818	19.1473 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-1.8801	-3.0490	-5.0338	-6.5094	-7.8366	-7.6298	-7.5300	-6.6751	-5.3456	-3.8011	-2.1977	-1.5810 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-0.0060	-0.0288	-0.0933	-0.2023	-0.3126	-0.3295	-0.3249	-0.2643	-0.1831	-0.0781	-0.0177	-0.0045 (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	528.0668 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	173.0522
Water heating fuel used	1305.0245 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	150.3512 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-60.9143 (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	1922.5283 (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	528.0668	0.1577	83.2889	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1305.0245	0.1408	183.7784	(264)
Space and water heating			267.0674	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	150.3512	0.1443	21.7003	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-59.0692	0.1318	-7.7874	
PV Unit electricity exported	-1.8451	0.1184	-0.2184	
Total			-8.0059	(269)
Total CO2, kg/year			280.7618	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.6200	(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	528.0668	1.5838	836.3579	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1305.0245	1.5207	1984.5657	(278)
Space and water heating			2820.9235	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	150.3512	1.5338	230.6138	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-59.0692	1.4871	-87.8407	
PV Unit electricity exported	-1.8451	0.4343	-0.8013	
Total			-88.6420	(283)
Total Primary energy kWh/year			2962.8953	(286)
Dwelling Primary energy Rate (DPER)			59.2600	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 50.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	120.0000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1667	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4167	(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) =	0.3542	(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	0.4516	0.4427	0.4339	0.3896	0.3807	0.3365	0.3365	0.3276	0.3542	0.3807	0.3984	0.4161	(22b)
Effective ac	0.6020	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5537	0.5627	0.5725	0.5794	0.5866	(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 Opening Type (Uw = 1.20)			12.5000	1.1450	14.3130			(27)
Heatloss Floor 1			50.0000	0.1300	6.5000			(28a)
External Wall 1	45.0000	12.5000	32.5000	0.1800	5.8500			(29a)
Total net area of external elements Aum(A, m2)			95.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6630			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							242.7200	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	46.0000	0.1600	7.3600
E6 Intermediate floor within a dwelling	66.0000	0.0000	0.0000
E16 Corner (normal)	28.8000	0.0900	2.5920
E18 Party wall between dwellings	9.6000	0.0600	0.5760
E2 Other lintels (including other steel lintels)	25.0000	0.0500	1.2500
E3 Sill	20.0000	0.0500	1.0000
E4 Jamb	60.0000	0.0500	3.0000
E11 Eaves (insulation at rafter level)	8.2000	0.0400	0.3280
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200
E10 Eaves (insulation at ceiling level)	20.0000	0.0600	1.2000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		18.0260	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	44.6890	(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	23.8374	23.6806	23.5269	22.8051	22.6701	22.0414	22.0414	21.9250	22.2836	22.6701	22.9433	23.2289	(38)

Heat transfer coeff

	68.5264	68.3696	68.2159	67.4941	67.3591	66.7304	66.7304	66.6140	66.9726	67.3591	67.6323	67.9179 (39)
Average = Sum(39)m / 12 =												67.4935

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3705	1.3674	1.3643	1.3499	1.3472	1.3346	1.3346	1.3323	1.3395	1.3472	1.3526	1.3584	(40)
HLP (average)												1.3499	
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												1.6901 (42)
Hot water usage for mixer showers												
	52.5569	51.7671	50.6162	48.4141	46.7890	44.9767	43.9465	45.0888	46.3409	48.2867	50.5361	52.3556 (42a)
Hot water usage for baths												
	22.7244	22.3869	21.9117	21.0354	20.3792	19.6517	19.2587	19.7306	20.2445	21.0230	21.9173	22.6476 (42b)
Hot water usage for other uses												
	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383 (42c)
Average daily hot water use (litres/day)												98.5597 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	107.2197	104.9310	102.1434	97.9036	94.4609	90.7597	89.3366	92.1121	95.0395	98.9252	103.2304	106.9415	(44)
Energy conte	169.8097	149.4203	156.9906	134.0251	127.1626	111.5996	108.0448	114.0541	117.1932	134.2406	147.0706	167.4445	(45)
Energy content (annual)										Total = Sum(45)m =		1637.0557	
Distribution loss (46)m = 0.15 x (45)m													
	25.4715	22.4130	23.5486	20.1038	19.0744	16.7399	16.2067	17.1081	17.5790	20.1361	22.0606	25.1167	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	216.4047	191.5060	203.5855	179.1170	173.7575	156.6915	154.6398	160.6490	162.2850	180.8355	192.1624	214.0394	(62)
WWHRS	-24.0268	-21.2495	-22.2513	-18.4249	-17.1714	-14.6937	-13.7730	-14.6462	-15.2026	-17.9222	-20.3037	-23.5819	(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													
	192.3778	170.2565	181.3342	160.6920	156.5861	141.9978	140.8668	146.0028	147.0824	162.9133	171.8587	190.4575	(64)
										Total per year (kWh/year) = Sum(64)m =		1962.4258	(64)
12Total per year (kWh/year)												1962	(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													
	93.7377	83.3508	89.4753	80.6368	79.5575	73.1803	73.2008	75.1989	75.0402	81.9109	84.9744	92.9512	(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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	74.2626	82.2193	74.2626	76.7380	74.2626	76.7380	74.2626	74.2626	76.7380	74.2626	76.7380	74.2626	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(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)													
	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)													
	125.9915	124.0340	120.2625	111.9956	106.9321	101.6394	98.3882	101.0738	104.2225	110.0953	118.0201	124.9344	(72)
Total internal gains													
	398.8396	406.3666	390.7883	376.8005	358.9151	343.3736	331.1507	332.3085	341.7827	356.3764	377.1230	391.2862	(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	3.2200	10.6334	0.6300	0.7000	0.7700	10.4640	(74)
East	3.5200	19.6403	0.6300	0.7000	0.7700	21.1282	(76)
West	5.7600	19.6403	0.6300	0.7000	0.7700	34.5734	(80)

Solar gains	66.1656	128.9613	213.4285	316.2956	394.2667	407.0470	386.0760	326.8119	249.5611	153.0992	82.3620	54.5296	(83)

Total gains	465.0051	535.3279	604.2168	693.0961	753.1819	750.4206	717.2267	659.1203	591.3437	509.4756	459.4850	445.8157	(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	49.1944	49.3072	49.4182	49.9467	50.0469	50.5184	50.5184	50.6066	50.3357	50.0469	49.8447	49.6351	
alpha	4.2796	4.2871	4.2945	4.3298	4.3365	4.3679	4.3679	4.3738	4.3557	4.3365	4.3230	4.3090	
util living area													
	0.9873	0.9761	0.9494	0.8724	0.7312	0.5471	0.4044	0.4560	0.7019	0.9161	0.9763	0.9893	(86)
MIT	19.5556	19.7806	20.1233	20.5515	20.8397	20.9650	20.9925	20.9876	20.9002	20.5051	19.9607	19.5214	(87)
Th 2	19.7860	19.7884	19.7908	19.8020	19.8041	19.8138	19.8138	19.8156	19.8101	19.8041	19.7998	19.7954	(88)
util rest of house													
	0.9833	0.9688	0.9339	0.8358	0.6646	0.4548	0.2979	0.3430	0.6088	0.8828	0.9677	0.9859	(89)
MIT 2	18.1525	18.4372	18.8638	19.3771	19.6809	19.7958	19.8117	19.8117	19.7491	19.3418	18.6758	18.1158	(90)
Living area fraction										fLA = Living area / (4) =		0.3800	(91)
MIT	18.6857	18.9477	19.3424	19.8234	20.1212	20.2401	20.2604	20.2586	20.1865	19.7838	19.1641	18.6499	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6857	18.9477	19.3424	19.8234	20.1212	20.2401	20.2604	20.2586	20.1865	19.7838	19.1641	18.6499	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9784	0.9622	0.9268	0.8366	0.6834	0.4890	0.3385	0.3861	0.6403	0.8821	0.9617	0.9815	(94)
Useful gains	454.9575	515.0705	560.0048	579.8270	514.7247	366.9266	242.7988	254.4681	378.6269	449.4230	441.8860	437.5724	(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													
	985.7981	960.4355	876.0555	737.2629	567.2472	376.3682	244.2612	257.0347	407.6316	618.6154	815.9193	981.4063	(97)
Space heating kWh													
	394.9454	299.2853	235.1417	113.3538	39.0768	0.0000	0.0000	0.0000	0.0000	125.8791	269.3040	404.6125	(98a)
Space heating requirement - total per year (kWh/year)												1881.5985	
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													
	394.9454	299.2853	235.1417	113.3538	39.0768	0.0000	0.0000	0.0000	0.0000	125.8791	269.3040	404.6125	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1881.5985	
Space heating per m2											(98c) / (4) =	37.6320	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	394.9454	299.2853	235.1417	113.3538	39.0768	0.0000	0.0000	0.0000	0.0000	125.8791	269.3040	404.6125	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	427.8932	324.2527	254.7581	122.8102	42.3367	0.0000	0.0000	0.0000	0.0000	136.3804	291.7703	438.3667	(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													
	192.3778	170.2565	181.3342	160.6920	156.5861	141.9978	140.8668	146.0028	147.0824	162.9133	171.8587	190.4575	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6364	85.3112	84.6435	83.2918	81.4486	79.8000	79.8000	79.8000	79.8000	83.4883	85.0628	85.7063	(217)
Fuel for water heating, kWh/month													
	224.6448	199.5711	214.2327	192.9267	192.2514	177.9421	176.5248	182.9609	184.3137	195.1331	202.0375	222.2212	(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	15.4303	12.3788	11.1457	8.1658	6.3075	5.1533	5.7539	7.4792	9.7147	12.7462	14.3968	15.8592	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.8319	-33.8314	-48.9876	-55.5376	-60.3279	-56.5260	-55.8772	-52.5565	-46.7283	-38.9382	-26.3015	-20.5810	(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	-12.7730	-26.9447	-53.6721	-80.7632	-106.9058	-107.4073	-106.0950	-89.7380	-65.6863	-38.5287	-17.0574	-10.0911	(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	2038.5682 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2364.7600 (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)	124.5314 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1235.6876 (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	3378.1721 (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	2038.5682	0.2100	428.0993	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2364.7600	0.2100	496.5996	(264)
Space and water heating			924.6989	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	124.5314	0.1443	17.9737	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-520.0251	0.1344	-69.8924	
PV Unit electricity exported	-715.6625	0.1259	-90.0679	
Total			-159.9603	(269)
Total CO2, kg/year			794.6417	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.8900	(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	2038.5682	1.1300	2303.5821	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2364.7600	1.1300	2672.1788	(278)
Space and water heating			4975.7610	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	124.5314	1.5338	191.0104	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-520.0251	1.4967	-778.3300	
PV Unit electricity exported	-715.6625	0.4620	-330.6104	
Total			-1108.9404	(283)
Total Primary energy kWh/year			4187.9318	(286)
Target Primary Energy Rate (TPER)			83.7600	(287)

Full SAP Calculation Printout

Property Reference	House Type T	Issued on Date	05/10/2023
Assessment Reference	Plot 6	Prop Type Ref	
Property			

SAP Rating	81 B	DER	5.60	TER	15.50
Environmental	96 A	% DER < TER			63.87
CO_2 Emissions (t/year)	0.26	DFEE	41.77	TFEE	45.69
Compliance Check	See BREL	% DFEE < TFEE			8.58
% DPER < TPER	27.67	DPER	59.03	TPER	81.61

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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		51.0000 (1b)	x	2.4000 (2b)	=	122.4000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	122.4000	(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	1 * 10	= 10.0000	(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) =	10.0000 / (5)	= 0.0817	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2817	(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)	= 0.2394	(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	0.3053	0.2993	0.2933	0.2634	0.2574	0.2275	0.2275	0.2215	0.2394	0.2574	0.2694	0.2813	(22b)
Effective ac	0.5466	0.5448	0.5430	0.5347	0.5331	0.5259	0.5259	0.5245	0.5287	0.5331	0.5363	0.5396	(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	
Opening Type 1 (Uw = 1.20)			20.6000	1.1450	23.5878			(27)
External Wall 1	45.0000	20.6000	24.4000	0.1900	4.6360	190.0000	4636.0000	(29a)
External Roof 1	50.0000		50.0000	0.1500	7.5000	9.0000	450.0000	(30)
Total net area of external elements Aum(A, m2)			95.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.7238			(33)
Party Floor 1			50.0000			40.0000	2000.0000	(32d)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7086.0000	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 138.9412 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	46.0000	0.0670	3.0820
E6 Intermediate floor within a dwelling	66.0000	0.0020	0.1320
E16 Corner (normal)	28.8000	0.0410	1.1808
E18 Party wall between dwellings	9.6000	0.0400	0.3840
E2 Other lintels (including other steel lintels)	25.0000	0.0240	0.6000
E3 Sill	20.0000	0.0190	0.3800
E4 Jamb	60.0000	0.0140	0.8400
E11 Eaves (insulation at rafter level)	8.2000	0.0110	0.0902
E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960
E10 Eaves (insulation at ceiling level)	20.0000	0.0460	0.9200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.0050 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 43.7288 (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	22.0783	22.0052	21.9336	21.5971	21.5341	21.2410	21.2410	21.1867	21.3539	21.5341	21.6615	21.7946	(38)
Heat transfer coeff	65.8071	65.7340	65.6624	65.3259	65.2629	64.9698	64.9698	64.9155	65.0827	65.2629	65.3903	65.5234	(39)

Average = Sum(39)m / 12 = 65.3256

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2903	1.2889	1.2875	1.2809	1.2797	1.2739	1.2739	1.2729	1.2761	1.2797	1.2822	1.2848	(40)
HLP (average)												1.2809	
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 1.7196 (42)

Hot water usage for mixer showers	53.0510	52.2538	51.0920	48.8692	47.2288	45.3995	44.3597	45.5127	46.7765	48.7407	51.0112	52.8478 (42a)
Hot water usage for baths	22.9369	22.5963	22.1166	21.2321	20.5698	19.8354	19.4388	19.9151	20.4338	21.2196	22.1223	22.8594 (42b)
Hot water usage for other uses	32.2401	31.0678	29.8954	28.7230	27.5507	26.3783	26.3783	27.5507	28.7230	29.8954	31.0678	32.2401 (42c)

Average daily hot water use (litres/day) 99.4866 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.2281	105.9178	103.1040	98.8243	95.3493	91.6132	90.1768	92.9784	95.9333	99.8556	104.2013	107.9473	(44)
Energy conte	171.4068	150.8256	158.4670	135.2856	128.3585	112.6492	109.0610	115.1267	118.2954	135.5032	148.4538	169.0194	(45)

Energy content (annual) Total = Sum(45)m = 1652.4520

Distribution loss (46)m = 0.15 x (45)m	25.7110	22.6238	23.7701	20.2928	19.2538	16.8974	16.3591	17.2690	17.7443	20.3255	22.2681	25.3529 (46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9720 (55)

Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	224.8012	199.0528	211.8614	186.9576	181.7529	164.3212	162.4554	168.5211	169.9674	188.8976	200.1258	222.4138 (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	-0.2943	-0.6620	-1.4053	-2.2662	-3.1376	-3.2092	-3.1650	-2.5849	-1.8015	-0.9808	-0.4027	-0.2287 (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	224.5069	198.3908	210.4561	184.6914	178.6153	161.1120	159.2904	165.9362	168.1658	187.9168	199.7231	222.1851 (64)

Total per year (kWh/year) = Sum(64)m = 2260.9898 (64)

12Total per year (kWh/year) 2261 (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	99.7083	88.7313	95.4058	86.3201	85.3947	78.7934	78.9783	80.9952	80.6708	87.7703	90.6985	98.9145 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	75.5724	83.6695	75.5724	78.0915	75.5724	78.0915	75.5724	75.5724	78.0915	75.5724	78.0915	75.5724 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.8308	151.3856	147.4676	139.1267	128.5978	118.7021	112.0911	110.5364	114.4543	122.7953	133.3242	143.2199 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979 (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)	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828 (71)

Water heating gains (Table 5)													
	134.0165	132.0406	128.2336	119.8890	114.7778	109.4353	106.1536	108.8645	112.0428	117.9709	125.9701	132.9495	(72)
Total internal gains													
	408.2133	415.8892	400.0672	385.9007	367.7416	355.0225	342.6107	343.7668	353.3822	365.1321	386.1794	400.5354	(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	5.3000	10.6334	0.7600	0.7000	0.7700	20.7775	(74)
East	5.8000	19.6403	0.7600	0.7000	0.7700	41.9972	(76)
West	9.5000	19.6403	0.7600	0.7000	0.7700	68.7885	(80)

Solar gains	131.5631	256.4271	424.3790	628.9048	783.9201	809.3218	767.6295	649.8084	496.2208	304.4226	163.7684	108.4259	(83)
Total gains	539.7765	672.3163	824.4462	1014.8056	1151.6617	1164.3442	1110.2403	993.5752	849.6030	669.5547	549.9478	508.9613	(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	29.9106	29.9439	29.9766	30.1310	30.1601	30.2961	30.2961	30.3215	30.2436	30.1601	30.1013	30.0401	
alpha	2.9940	2.9963	2.9984	3.0087	3.0107	3.0197	3.0197	3.0214	3.0162	3.0107	3.0068	3.0027	
util living area													
	0.9357	0.8881	0.8010	0.6506	0.4878	0.3467	0.2543	0.2949	0.4891	0.7558	0.8994	0.9444	(86)
Living	19.1489	19.5618	20.0902	20.5930	20.8587	20.9620	20.9889	20.9826	20.8951	20.4601	19.7058	19.0643	
Non living	17.7520	18.2587	18.8908	19.4632	19.7390	19.8372	19.8567	19.8543	19.7855	19.3427	18.4516	17.6500	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.0530	19.5618	20.0902	20.5930	20.8587	20.9620	20.9889	20.9826	20.8951	20.4601	19.7058	19.3351	(87)
Th 2	19.8484	19.8495	19.8506	19.8558	19.8568	19.8613	19.8613	19.8622	19.8596	19.8568	19.8548	19.8528	(88)
util rest of house													
	0.9245	0.8702	0.7724	0.6088	0.4367	0.2884	0.1898	0.2242	0.4195	0.7108	0.8800	0.9346	(89)
MIT 2	19.0127	18.2587	18.8908	19.4632	19.7390	19.8372	19.8567	19.8543	19.7855	19.3427	18.4516	18.0469	(90)
Living area fraction										fLA = Living area / (4) =		0.4118	(91)
MIT	19.4410	18.7953	19.3846	19.9284	20.2001	20.3004	20.3229	20.3189	20.2424	19.8028	18.9680	18.5773	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4410	18.7953	19.3846	19.9284	20.2001	20.3004	20.3229	20.3189	20.2424	19.8028	18.9680	18.5773	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9200	0.8508	0.7595	0.6116	0.4524	0.3112	0.2161	0.2529	0.4436	0.7085	0.8618	0.9209	(94)
Useful gains	496.5710	571.9851	626.1751	620.6069	521.0541	362.3257	239.9733	251.2978	376.8744	474.3901	473.9351	468.6979	(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													
	996.3886	913.3916	846.0363	720.4405	554.7383	370.3516	241.8756	254.3961	399.7646	600.6018	776.0533	942.0523	(97)
Space heating kWh													
	371.8642	229.4252	163.5768	71.8802	25.0611	0.0000	0.0000	0.0000	0.0000	93.9015	217.5252	352.1756	(98a)
Space heating requirement - total per year (kWh/year)												1525.4098	
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													
	371.8642	229.4252	163.5768	71.8802	25.0611	0.0000	0.0000	0.0000	0.0000	93.9015	217.5252	352.1756	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1525.4098	
Space heating per m2											(98c) / (4) =	29.9100	(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 %)												253.2383	(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													
	371.8642	229.4252	163.5768	71.8802	25.0611	0.0000	0.0000	0.0000	0.0000	93.9015	217.5252	352.1756	(98)
Space heating efficiency (main heating system 1)													
	253.2383	253.2383	253.2383	253.2383	253.2383	0.0000	0.0000	0.0000	0.0000	253.2383	253.2383	253.2383	(210)
Space heating fuel (main heating system)													
	146.8436	90.5966	64.5940	28.3844	9.8962	0.0000	0.0000	0.0000	0.0000	37.0803	85.8974	139.0689	(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												
	224.5069	198.3908	210.4561	184.6914	178.6153	161.1120	159.2904	165.9362	168.1658	187.9168	199.7231	222.1851 (64)
Efficiency of water heater												172.7685 (216)
(217)m	172.7685	172.7685	172.7685	172.7685	172.7685	172.7685	172.7685	172.7685	172.7685	172.7685	172.7685	172.7685 (217)
Fuel for water heating, kWh/month												
	129.9467	114.8304	121.8139	106.9011	103.3842	93.2531	92.1988	96.0454	97.3359	108.7680	115.6015	128.6028 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	19.0068	15.2480	13.7291	10.0586	7.7695	6.3478	7.0876	9.2127	11.9664	15.7006	17.7338	19.5351 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-3.6649	-5.8762	-9.5963	-12.2426	-14.5537	-14.0648	-13.8815	-12.3819	-10.0101	-7.2623	-4.2586	-3.0864 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-0.0150	-0.0746	-0.2299	-0.5012	-0.8148	-0.9066	-0.8940	-0.7279	-0.5052	-0.1956	-0.0467	-0.0126 (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	602.3614 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	172.7685
Water heating fuel used	1308.6818 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	153.3962 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-115.8034 (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	1948.6360 (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	602.3614	0.1567	94.3608	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1308.6818	0.1409	184.3923	(264)
Space and water heating			278.7531	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	153.3962	0.1443	22.1398	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-110.8792	0.1321	-14.6480	
PV Unit electricity exported	-4.9242	0.1174	-0.5781	
Total			-15.2261	(269)
Total CO2, kg/year			285.6667	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.6000	(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	602.3614	1.5799	951.6545	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1308.6818	1.5210	1990.4975	(278)
Space and water heating			2942.1520	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	153.3962	1.5338	235.2841	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-110.8792	1.4881	-164.9998	
PV Unit electricity exported	-4.9242	0.4305	-2.1201	
Total			-167.1199	(283)
Total Primary energy kWh/year			3010.3163	(286)
Dwelling Primary energy Rate (DPER)			59.0300	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.0000 (1b)	x	2.4000 (2b)	=	122.4000 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 51.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	122.4000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1634	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4134	(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) =	0.3514	(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	0.4480	0.4392	0.4305	0.3865	0.3777	0.3338	0.3338	0.3250	0.3514	0.3777	0.3953	0.4129	(22b)
Effective ac	0.6004	0.5965	0.5926	0.5747	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852	(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 Opening Type (Uw = 1.20)			12.7500	1.1450	14.5992			(27)
External Wall 1	45.0000	12.7500	32.2500	0.1800	5.8050			(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000			(30)
Total net area of external elements Aum(A, m2)			95.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.9042			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 138.9412 (35)

List of Thermal Bridges

	Length	Psi-value	Total
E5 Ground floor (normal)	46.0000	0.1600	7.3600
E6 Intermediate floor within a dwelling	66.0000	0.0000	0.0000
E16 Corner (normal)	28.8000	0.0900	2.5920
E18 Party wall between dwellings	9.6000	0.0600	0.5760
E2 Other lintels (including other steel lintels)	25.0000	0.0500	1.2500
E3 Sill	20.0000	0.0500	1.0000
E4 Jamb	60.0000	0.0500	3.0000
E11 Eaves (insulation at rafter level)	8.2000	0.0400	0.3280
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200
E10 Eaves (insulation at ceiling level)	20.0000	0.0600	1.2000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 18.0260 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 43.9302 (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	24.2498	24.0924	23.9381	23.2134	23.0778	22.4465	22.4465	22.3297	22.6897	23.0778	23.3521	23.6388	(38)

Heat transfer coeff

	68.1800	68.0226	67.8683	67.1436	67.0080	66.3768	66.3768	66.2599	66.6199	67.0080	67.2823	67.5691 (39)
Average = Sum(39)m / 12 =												67.1429
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3369	1.3338	1.3308	1.3165	1.3139	1.3015	1.3015	1.2992	1.3063	1.3139	1.3193	1.3249 (40)
HLP (average)												1.3165
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												1.7196 (42)
Hot water usage for mixer showers												
	53.0510	52.2538	51.0920	48.8692	47.2288	45.3995	44.3597	45.5127	46.7765	48.7407	51.0112	52.8478 (42a)
Hot water usage for baths												
	22.9369	22.5963	22.1166	21.2321	20.5698	19.8354	19.4388	19.9151	20.4338	21.2196	22.1223	22.8594 (42b)
Hot water usage for other uses												
	32.2401	31.0678	29.8954	28.7230	27.5507	26.3783	26.3783	27.5507	28.7230	29.8954	31.0678	32.2401 (42c)
Average daily hot water use (litres/day)												99.4866 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	108.2281	105.9178	103.1040	98.8243	95.3493	91.6132	90.1768	92.9784	95.9333	99.8556	104.2013	107.9473 (44)
Energy conte	171.4068	150.8256	158.4670	135.2856	128.3585	112.6492	109.0610	115.1267	118.2954	135.5032	148.4538	169.0194 (45)
Energy content (annual)										Total = Sum(45)m =		1652.4520
Distribution loss (46)m = 0.15 x (45)m												
	25.7110	22.6238	23.7701	20.2928	19.2538	16.8974	16.3591	17.2690	17.7443	20.3255	22.2681	25.3529 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	218.0017	192.9113	205.0619	180.3774	174.9534	157.7410	155.6559	161.7216	163.3872	182.0981	193.5456	215.6143 (62)
WWHRS	-24.2527	-21.4493	-22.4605	-18.5982	-17.3328	-14.8318	-13.9025	-14.7839	-15.3456	-18.0907	-20.4946	-23.8036 (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												
	193.7490	171.4620	182.6014	161.7793	157.6206	142.9092	141.7534	146.9378	148.0416	164.0073	173.0510	191.8107 (64)
									Total per year (kWh/year) = Sum(64)m =			1975.7233 (64)
12Total per year (kWh/year)												1976 (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												
	94.2687	83.8181	89.9662	81.0559	79.9551	73.5293	73.5387	75.5556	75.4067	82.3307	85.4344	93.4749 (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	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	75.5724	83.6695	75.5724	78.0915	75.5724	78.0915	75.5724	75.5724	78.0915	75.5724	78.0915	75.5724 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	149.8308	151.3856	147.4676	139.1267	128.5978	118.7021	112.0911	110.5364	114.4543	122.7953	133.3242	143.2199 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828 (71)
Water heating gains (Table 5)												
	126.7052	124.7293	120.9223	112.5777	107.4666	102.1240	98.8423	101.5532	104.7315	110.6596	118.6588	125.6383 (72)
Total internal gains												
	403.9020	411.5779	395.7559	381.5894	363.4303	347.7112	335.2995	336.4555	346.0709	360.8208	381.8681	396.2241 (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	3.2800	10.6334	0.6300	0.7000	0.7700	10.6590 (74)
East	3.5900	19.6403	0.6300	0.7000	0.7700	21.5483 (76)
West	5.8800	19.6403	0.6300	0.7000	0.7700	35.2936 (80)

Solar gains	67.5010	131.5649	217.7358	322.6711	402.2037	415.2360	393.8453	333.3957	254.5954	156.1899	84.0245	55.6300 (83)

Total gains	471.4030	543.1428	613.4917	704.2605	765.6340	762.9472	729.1448	669.8513	600.6663	517.0108	465.8926	451.8541	(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	28.8696	28.9365	29.0022	29.3153	29.3746	29.6539	29.6539	29.7063	29.5457	29.3746	29.2548	29.1307	
alpha	2.9246	2.9291	2.9335	2.9544	2.9583	2.9769	2.9769	2.9804	2.9697	2.9583	2.9503	2.9420	
util living area													
	0.9541	0.9310	0.8885	0.7978	0.6661	0.5090	0.3844	0.4302	0.6412	0.8461	0.9314	0.9589	(86)
MIT	18.8797	19.1839	19.6464	20.2244	20.6496	20.8866	20.9633	20.9483	20.7687	20.1964	19.4497	18.8326	(87)
Th 2	19.8121	19.8145	19.8168	19.8279	19.8300	19.8397	19.8397	19.8414	19.8359	19.8300	19.8258	19.8214	(88)
util rest of house													
	0.9456	0.9185	0.8682	0.7622	0.6102	0.4308	0.2894	0.3312	0.5637	0.8099	0.9168	0.9511	(89)
MIT 2	17.3953	17.7760	18.3484	19.0458	19.5216	19.7635	19.8236	19.8169	19.6626	19.0362	18.1229	17.3419	(90)
Living area fraction										fLA = Living area / (4) =		0.4118	(91)
MIT	18.0065	18.3558	18.8829	19.5311	19.9861	20.2260	20.2929	20.2828	20.1181	19.5139	18.6692	17.9557	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0065	18.3558	18.8829	19.5311	19.9861	20.2260	20.2929	20.2828	20.1181	19.5139	18.6692	17.9557	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9281	0.8988	0.8489	0.7521	0.6182	0.4578	0.3274	0.3701	0.5839	0.7985	0.8983	0.9346	(94)
Useful gains	437.5204	488.1862	520.8169	529.6907	473.2852	349.2969	238.6982	247.9191	350.7000	412.8424	418.5161	422.3180	(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													
	934.5094	915.2959	840.4064	713.8105	555.2322	373.4328	245.1220	257.2743	400.9246	597.3054	778.4051	929.4599	(97)
Space heating kWh													
	369.7598	287.0177	237.7746	132.5662	60.9686	0.0000	0.0000	0.0000	0.0000	137.2405	259.1201	377.3136	(98a)
Space heating requirement - total per year (kWh/year)												1861.7610	
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													
	369.7598	287.0177	237.7746	132.5662	60.9686	0.0000	0.0000	0.0000	0.0000	137.2405	259.1201	377.3136	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1861.7610	
Space heating per m2											(98c) / (4) =	36.5051	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	369.7598	287.0177	237.7746	132.5662	60.9686	0.0000	0.0000	0.0000	0.0000	137.2405	259.1201	377.3136	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	400.6065	310.9617	257.6106	143.6254	66.0548	0.0000	0.0000	0.0000	0.0000	148.6896	280.7368	408.7904	(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													
	193.7490	171.4620	182.6014	161.7793	157.6206	142.9092	141.7534	146.9378	148.0416	164.0073	173.0510	191.8107	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4851	85.2062	84.6529	83.6168	82.1215	79.8000	79.8000	79.8000	79.8000	83.6630	84.9630	85.5483	(217)
Fuel for water heating, kWh/month													
	226.6465	201.2319	215.7061	193.4770	191.9359	179.0842	177.6359	184.1325	185.5158	196.0334	203.6780	224.2134	(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	15.7025	12.5971	11.3423	8.3098	6.4188	5.2442	5.8554	7.6111	9.8860	12.9710	14.6507	16.1389	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.2875	-34.4672	-49.8915	-56.5412	-61.3976	-57.5180	-56.8550	-53.4846	-47.5685	-39.6574	-26.7993	-20.9754	(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	-13.0496	-27.5245	-54.8214	-82.4856	-109.1807	-109.6939	-108.3566	-91.6558	-67.0944	-39.3588	-17.4268	-10.3101	(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	2017.0758 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2379.2906 (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)	126.7278 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1260.4014 (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	3348.6929 (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	2017.0758	0.2100	423.5859	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2379.2906	0.2100	499.6510	(264)
Space and water heating			923.2369	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	126.7278	0.1443	18.2907	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-529.4431	0.1344	-71.1627	
PV Unit electricity exported	-730.9583	0.1259	-91.9942	
Total			-163.1569	(269)
Total CO2, kg/year			790.3001	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.5000	(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	2017.0758	1.1300	2279.2957	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2379.2906	1.1300	2688.5984	(278)
Space and water heating			4967.8940	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	126.7278	1.5338	194.3794	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-529.4431	1.4967	-792.4429	
PV Unit electricity exported	-730.9583	0.4620	-337.6814	
Total			-1130.1243	(283)
Total Primary energy kWh/year			4162.2500	(286)
Target Primary Energy Rate (TPER)			81.6100	(287)

Full SAP Calculation Printout

Property Reference	House Type U	Issued on Date	05/10/2023
Assessment Reference	Plot 7	Prop Type Ref	
Property			

SAP Rating	82 B	DER	3.80	TER	10.37
Environmental	96 A	% DER < TER			63.36
CO_2 Emissions (t/year)	0.45	DFEE	33.46	TFEE	38.66
Compliance Check	See BREL	% DFEE < TFEE			13.45
% DPER < TPER	26.28	DPER	39.93	TPER	54.17

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	46.0000 (1b)	x	2.4000 (2b)	=	110.4000 (1b)	-
First floor	48.0000 (1c)	x	2.4000 (2c)	=	115.2000 (1c)	-
Second floor	36.0000 (1d)	x	2.4000 (2d)	=	86.4000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	130.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	312.0000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0321	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2321	(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) =	0.1972	(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	0.2515	0.2466	0.2416	0.2170	0.2120	0.1874	0.1874	0.1825	0.1972	0.2120	0.2219	0.2318	(22b)
Effective ac	0.5316	0.5304	0.5292	0.5235	0.5225	0.5176	0.5176	0.5166	0.5195	0.5225	0.5246	0.5269	(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	
Opening Type 1 (Uw = 1.20)			31.0000	1.1450	35.4962			(27)
Heatloss Floor 1			46.0000	0.1200	5.5200	110.0000	5060.0000	(28a)
External Wall 1	182.0000	31.0000	151.0000	0.1900	28.6900	190.0000	28690.0000	(29a)
External Roof 1	46.0000		46.0000	0.1500	6.9000	9.0000	414.0000	(30)
External Roof 2	2.0000		2.0000	0.1500	0.3000	9.0000	18.0000	(30)
Total net area of external elements Aum(A, m2)			276.0000					(31)

Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 76.9062 (33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 34182.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 262.9385 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	46.0000	0.0670	3.0820
E6 Intermediate floor within a dwelling	66.0000	0.0020	0.1320
E16 Corner (normal)	28.8000	0.0410	1.1808
E2 Other lintels (including other steel lintels)	25.0000	0.0240	0.6000
E3 Sill	20.0000	0.0190	0.3800
E4 Jamb	60.0000	0.0140	0.8400
E10 Eaves (insulation at ceiling level)	20.0000	0.0460	0.9200
E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5308 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 84.4370 (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	54.7359	54.6094	54.4855	53.9034	53.7945	53.2876	53.2876	53.1937	53.4828	53.7945	54.0148	54.2452	(38)
Heat transfer coeff	139.1728	139.0464	138.9225	138.3404	138.2315	137.7245	137.7245	137.6307	137.9198	138.2315	138.4518	138.6821	(39)

Average = Sum(39)m / 12 = 138.3399

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0706	1.0696	1.0686	1.0642	1.0633	1.0594	1.0594	1.0587	1.0609	1.0633	1.0650	1.0668	(40)
HLP (average)												1.0642	
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 2.8950 (42)
Hot water usage for mixer showers

72.7593	71.6659	70.0725	67.0240	64.7742	62.2653	60.8392	62.4205	64.1538	66.8477	69.9617	72.4805	(42a)

Hot water usage for baths

31.4121	30.9456	30.2886	29.0773	28.1703	27.1646	26.6214	27.2737	27.9840	29.0602	30.2964	31.3059	(42b)

Hot water usage for other uses

44.2776	42.6675	41.0574	39.4473	37.8372	36.2271	36.2271	37.8372	39.4473	41.0574	42.6675	44.2776	(42c)

Average daily hot water use (litres/day) 136.4580 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.4490	145.2790	141.4186	135.5486	130.7817	125.6570	123.6877	127.5314	131.5852	136.9653	142.9256	148.0640	(44)
Energy conte	235.1069	206.8753	217.3551	185.5593	176.0573	154.5099	149.5895	157.9105	162.2577	185.8606	203.6238	231.8325	(45)

Energy content (annual) Total = Sum(45)m = 2266.5384

Distribution loss (46)m = 0.15 x (45)m	35.2660	31.0313	32.6033	27.8339	26.4086	23.1765	22.4384	23.6866	24.3387	27.8791	30.5436	34.7749	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

288.5013	255.1025	270.7495	237.2313	229.4517	206.1819	202.9839	211.3049	213.9297	239.2550	255.2958	285.2269	(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

288.5013	255.1025	270.7495	237.2313	229.4517	206.1819	202.9839	211.3049	213.9297	239.2550	255.2958	285.2269	(64)

Total per year (kWh/year) = Sum(64)m = 2895.2144 (64)
12Total per year (kWh/year) 2895 (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

120.8886	107.3678	114.9861	103.0361	101.2546	92.7122	92.4540	95.2208	95.2883	104.5142	109.0425	119.7998	(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	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	150.1658	166.2550	150.1658	155.1714	150.1658	155.1714	150.1658	150.1658	155.1714	150.1658	155.1714	150.1658	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.7205	300.8100	293.0247	276.4510	255.5295	235.8663	222.7301	219.6407	227.4259	243.9997	264.9211	284.5843	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	(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)

	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	(71)
Water heating gains (Table 5)												
	162.4846	159.7735	154.5512	143.1056	136.0949	128.7669	124.2662	127.9849	132.3448	140.4760	151.4479	161.0213 (72)
Total internal gains												
	676.7959	693.2633	664.1666	641.1528	608.2151	586.2294	563.5870	564.2163	581.3670	601.0664	637.9653	662.1963 (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	8.0000	10.6334	0.7600	0.7000	0.7700	31.3622 (74)
South	11.5000	46.7521	0.7600	0.7000	0.7700	198.2182 (78)
West	11.5000	19.6403	0.7600	0.7000	0.7700	83.2703 (80)

Solar gains	312.8507	547.4594	783.6291	1022.2031	1186.8821	1195.4480	1145.4983	1020.8749	866.4231	614.7766	377.4737	265.9013 (83)
Total gains	989.6465	1240.7228	1447.7957	1663.3558	1795.0972	1781.6774	1709.0852	1585.0912	1447.7901	1215.8430	1015.4390	928.0975 (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	68.2245	68.2866	68.3475	68.6350	68.6891	68.9420	68.9420	68.9890	68.8444	68.6891	68.5798	68.4659	
alpha	5.5483	5.5524	5.5565	5.5757	5.5793	5.5961	5.5961	5.5993	5.5896	5.5793	5.5720	5.5644	
util living area													
	0.9949	0.9828	0.9493	0.8506	0.6806	0.4898	0.3539	0.3980	0.6343	0.9093	0.9864	0.9964	(86)
Living	19.9239	20.1810	20.4857	20.7916	20.9487	20.9929	20.9990	20.9982	20.9732	20.7329	20.2579	19.8705	
Non living	18.7823	19.1076	19.4835	19.8374	19.9931	20.0306	20.0338	20.0342	20.0174	19.7846	19.2104	18.7165	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	5	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	26	1	0	0	0	0	0	0	0	0	0	31	
MIT	20.4888	20.1937	20.4857	20.7916	20.9487	20.9929	20.9990	20.9982	20.9732	20.7329	20.2579	20.3603	(87)
Th 2	20.0249	20.0257	20.0265	20.0302	20.0309	20.0341	20.0341	20.0347	20.0329	20.0309	20.0295	20.0281	(88)
util rest of house													
	0.9933	0.9774	0.9342	0.8134	0.6211	0.4182	0.2766	0.3153	0.5548	0.8759	0.9812	0.9952	(89)
MIT 2	19.5649	19.1259	19.4835	19.8374	19.9931	20.0306	20.0338	20.0342	20.0174	19.7846	19.2104	19.4492	(90)
Living area fraction									fLA = Living area / (4) =			0.1385	(91)
MIT	19.6928	19.2738	19.6223	19.9695	20.1254	20.1639	20.1675	20.1676	20.1497	19.9159	19.3555	19.5753	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6928	19.2738	19.6223	19.9695	20.1254	20.1639	20.1675	20.1676	20.1497	19.9159	19.3555	19.5753	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9925	0.9719	0.9266	0.8108	0.6272	0.4279	0.2873	0.3267	0.5648	0.8713	0.9762	0.9945	(94)
Useful gains	982.2640	1205.8550	1341.5232	1348.6261	1125.8000	762.3776	491.0036	517.8724	817.6952	1059.3251	991.2777	922.9553	(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													
	2142.2653	1998.6234	1822.9760	1531.3607	1164.6536	766.2789	491.3307	518.5420	834.3762	1287.7495	1696.7900	2132.2819	(97)
Space heating kWh													
	863.0410	532.7403	358.2009	131.5689	28.9071	0.0000	0.0000	0.0000	0.0000	169.9477	507.9689	899.7389	(98a)
Space heating requirement - total per year (kWh/year)												3492.1137	
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													
	863.0410	532.7403	358.2009	131.5689	28.9071	0.0000	0.0000	0.0000	0.0000	169.9477	507.9689	899.7389	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3492.1137	
Space heating per m2											(98c) / (4) =	26.8624	(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 %)	291.8585 (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													
	863.0410	532.7403	358.2009	131.5689	28.9071	0.0000	0.0000	0.0000	0.0000	169.9477	507.9689	899.7389	(98)
Space heating efficiency (main heating system 1)													
	291.8585	291.8585	291.8585	291.8585	291.8585	0.0000	0.0000	0.0000	0.0000	291.8585	291.8585	291.8585	(210)
Space heating fuel (main heating system)													
	295.7053	182.5338	122.7310	45.0797	9.9045	0.0000	0.0000	0.0000	0.0000	58.2295	174.0463	308.2792	(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
288.5013 255.1025 270.7495 237.2313 229.4517 206.1819 202.9839 211.3049 213.9297 239.2550 255.2958 285.2269 (64)
Efficiency of water heater 157.6656 (216)
(217)m 157.6656 157.6656 157.6656 157.6656 157.6656 157.6656 157.6656 157.6656 157.6656 157.6656 157.6656 157.6656 (217)
Fuel for water heating, kWh/month
182.9831 161.7998 171.7239 150.4649 145.5307 130.7717 128.7433 134.0210 135.6857 151.7484 161.9223 180.9063 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (231)
Lighting 40.7081 32.6575 29.4045 21.5430 16.6404 13.5954 15.1799 19.7315 25.6292 33.6269 37.9815 41.8395 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 1196.5094 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 157.6656
Water heating fuel used 1836.3010 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
Total electricity for the above, kWh/year 0.0000 (231)
Electricity for lighting (calculated in Appendix L) 328.5373 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (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 3361.3477 (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	1196.5094	0.1574	188.3867	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1836.3010	0.1410	258.8374	(264)
Space and water heating			447.2241	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	328.5373	0.1443	47.4181	(268)
Total CO2, kg/year			494.6422	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1196.5094	1.5828	1893.8596	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1836.3010	1.5212	2793.3930	(278)
Space and water heating			4687.2526	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	328.5373	1.5338	503.9215	(282)
Total Primary energy kWh/year			5191.1741	(286)
Dwelling Primary energy Rate (DPER)			39.9300	(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	46.0000 (1b)	x	2.4000 (2b)	=	110.4000 (1b)	-
First floor	48.0000 (1c)	x	2.4000 (2c)	=	115.2000 (1c)	-
Second floor	36.0000 (1d)	x	2.4000 (2d)	=	86.4000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	130.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	312.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1282	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3782	(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) =	0.3215	(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	0.4099	0.4018	0.3938	0.3536	0.3456	0.3054	0.3054	0.2974	0.3215	0.3456	0.3617	0.3777	(22b)
Effective ac	0.5840	0.5807	0.5775	0.5625	0.5597	0.5466	0.5466	0.5442	0.5517	0.5597	0.5654	0.5713	(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 Opening Type (Uw = 1.20)			31.0000	1.1450	35.4962			(27)
Heatloss Floor 1			46.0000	0.1300	5.9800			(28a)
External Wall 1	182.0000	31.0000	151.0000	0.1800	27.1800			(29a)
External Roof 1	46.0000		46.0000	0.1100	5.0600			(30)
External Roof 2	2.0000		2.0000	0.1100	0.2200			(30)
Total net area of external elements Aum(A, m2)			276.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		73.9362			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 262.9385 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	46.0000	0.1600	7.3600
E6 Intermediate floor within a dwelling	66.0000	0.0000	0.0000
E16 Corner (normal)	28.8000	0.0900	2.5920
E2 Other lintels (including other steel lintels)	25.0000	0.0500	1.2500
E3 Sill	20.0000	0.0500	1.0000
E4 Jamb	60.0000	0.0500	3.0000
E10 Eaves (insulation at ceiling level)	20.0000	0.0600	1.2000
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		17.1220	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	91.0582	(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	60.1287	59.7929	59.4637	57.9175	57.6282	56.2815	56.2815	56.0321	56.8002	57.6282	58.2134	58.8253	(38)
Heat transfer coeff	151.1869	150.8511	150.5219	148.9757	148.6864	147.3397	147.3397	147.0903	147.8584	148.6864	149.2716	149.8834	(39)
Average = Sum(39)m / 12 =												148.9743	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1630	1.1604	1.1579	1.1460	1.1437	1.1334	1.1334	1.1315	1.1374	1.1437	1.1482	1.1529	(40)
HLP (average)												1.1460	
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												2.8950	(42)
Hot water usage for mixer showers													
	72.7593	71.6659	70.0725	67.0240	64.7742	62.2653	60.8392	62.4205	64.1538	66.8477	69.9617	72.4805	(42a)
Hot water usage for baths													
	31.4121	30.9456	30.2886	29.0773	28.1703	27.1646	26.6214	27.2737	27.9840	29.0602	30.2964	31.3059	(42b)
Hot water usage for other uses													
	44.2776	42.6675	41.0574	39.4473	37.8372	36.2271	36.2271	37.8372	39.4473	41.0574	42.6675	44.2776	(42c)
Average daily hot water use (litres/day)												136.4580	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.4490	145.2790	141.4186	135.5486	130.7817	125.6570	123.6877	127.5314	131.5852	136.9653	142.9256	148.0640	(44)
Energy conte	235.1069	206.8753	217.3551	185.5593	176.0573	154.5099	149.5895	157.9105	162.2577	185.8606	203.6238	231.8325	(45)
Energy content (annual)										Total = Sum(45)m =		2266.5384	
Distribution loss (46)m = 0.15 x (45)m													
	35.2660	31.0313	32.6033	27.8339	26.4086	23.1765	22.4384	23.6866	24.3387	27.8791	30.5436	34.7749	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	281.7018	248.9610	263.9500	230.6511	222.6523	199.6018	196.1844	204.5054	207.3495	232.4555	248.7156	278.4274	(62)
WWHRS	-33.2625	-29.4176	-30.8045	-25.5073	-23.7719	-20.3418	-19.0672	-20.2760	-21.0464	-24.8114	-28.1083	-32.6465	(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													
	248.4393	219.5434	233.1455	205.1438	198.8804	179.2600	177.1173	184.2294	186.3031	207.6441	220.6074	245.7808	(64)
										Total per year (kWh/year) = Sum(64)m =		2506.0944	(64)
12Total per year (kWh/year)												2506	(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													
	115.4490	102.4546	109.5465	97.7719	95.8150	87.4480	87.0144	89.7812	90.0242	99.0746	103.7784	114.3602	(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	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	150.1658	166.2550	150.1658	155.1714	150.1658	155.1714	150.1658	150.1658	155.1714	150.1658	155.1714	150.1658	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	297.7205	300.8100	293.0247	276.4510	255.5295	235.8663	222.7301	219.6407	227.4259	243.9997	264.9211	284.5843	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	(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)													
	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	(71)
Water heating gains (Table 5)													
	155.1733	152.4622	147.2399	135.7943	128.7836	121.4556	116.9549	120.6736	125.0335	133.1647	144.1366	153.7100	(72)
Total internal gains													
	672.4846	688.9520	659.8553	636.8415	603.9038	578.9181	556.2757	556.9050	574.0557	596.7551	633.6540	657.8850	(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	8.0000	10.6334	0.6300	0.7000	0.7700	25.9976	(74)
South	11.5000	46.7521	0.6300	0.7000	0.7700	164.3124	(78)
West	11.5000	19.6403	0.6300	0.7000	0.7700	69.0267	(80)

Solar gains	259.3367	453.8151	649.5872	847.3525	983.8628	990.9635	949.5578	846.2516	718.2192	509.6175	312.9059	220.4182	(83)
Total gains	931.8213	1142.7671	1309.4426	1484.1940	1587.7666	1569.8816	1505.8335	1403.1566	1292.2749	1106.3726	946.5598	878.3031	(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	62.8031	62.9429	63.0805	63.7352	63.8592	64.4429	64.4429	64.5522	64.2168	63.8592	63.6089	63.3492	
alpha	5.1869	5.1962	5.2054	5.2490	5.2573	5.2962	5.2962	5.3035	5.2811	5.2573	5.2406	5.2233	
util living area													
	0.9964	0.9894	0.9708	0.9094	0.7770	0.5839	0.4277	0.4769	0.7278	0.9442	0.9910	0.9973	(86)
MIT	19.7383	19.9735	20.2790	20.6410	20.8818	20.9790	20.9966	20.9941	20.9367	20.6021	20.0992	19.6998	(87)
Th 2	19.9497	19.9518	19.9539	19.9635	19.9653	19.9737	19.9737	19.9752	19.9704	19.9653	19.9616	19.9578	(88)
util rest of house													
	0.9952	0.9858	0.9609	0.8805	0.7170	0.4976	0.3295	0.3735	0.6423	0.9196	0.9874	0.9964	(89)
MIT 2	18.4906	18.7910	19.1754	19.6163	19.8732	19.9629	19.9727	19.9734	19.9318	19.5836	18.9598	18.4474	(90)
Living area fraction											fLA = Living area / (4) =	0.1385	(91)
MIT	18.6633	18.9547	19.3282	19.7582	20.0129	20.1036	20.1145	20.1147	20.0709	19.7246	19.1176	18.6208	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6633	18.9547	19.3282	19.7582	20.0129	20.1036	20.1145	20.1147	20.0709	19.7246	19.1176	18.6208	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9929	0.9810	0.9532	0.8738	0.7200	0.5089	0.3431	0.3878	0.6513	0.9124	0.9831	0.9946	(94)
Useful gains	925.1783	1121.0664	1248.1254	1296.9186	1143.2637	798.8518	516.6294	544.1482	841.6923	1009.4732	930.5830	873.5612	(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													
	2171.5457	2120.1675	1930.9199	1617.6058	1236.0127	810.8931	517.8218	546.3978	882.8498	1356.7093	1793.8797	2161.4367	(97)
Space heating kWh													
	927.2973	671.3960	507.9991	230.8948	69.0052	0.0000	0.0000	0.0000	0.0000	258.3437	621.5736	958.1794	(98a)
Space heating requirement - total per year (kWh/year)												4244.6890	
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													
	927.2973	671.3960	507.9991	230.8948	69.0052	0.0000	0.0000	0.0000	0.0000	258.3437	621.5736	958.1794	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4244.6890	
Space heating per m2											(98c) / (4) =	32.6515	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	927.2973	671.3960	507.9991	230.8948	69.0052	0.0000	0.0000	0.0000	0.0000	258.3437	621.5736	958.1794	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	1004.6558	727.4062	550.3782	250.1569	74.7619	0.0000	0.0000	0.0000	0.0000	279.8956	673.4275	1038.1142	(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													
	248.4393	219.5434	233.1455	205.1438	198.8804	179.2600	177.1173	184.2294	186.3031	207.6441	220.6074	245.7808	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.7330	86.3988	85.7575	84.3256	81.9392	79.8000	79.8000	79.8000	79.8000	84.5508	86.2519	86.8015	(217)
Fuel for water heating, kWh/month													
	286.4414	254.1045	271.8661	243.2758	242.7169	224.6366	221.9514	230.8639	233.4626	245.5849	255.7711	283.1527	(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	31.2015	25.0310	22.5376	16.5120	12.7544	10.4204	11.6350	15.1236	19.6440	25.7740	29.1117	32.0687	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-44.2558	-63.0359	-91.5138	-103.9189	-112.8644	-105.5578	-104.1712	-97.8987	-87.0365	-72.4556	-48.8496	-38.1799	(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	-23.0973	-48.7921	-97.3802	-146.8744	-194.8454	-196.0795	-193.8577	-163.9232	-119.8064	-70.0835	-30.9308	-18.2566	(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												4598.7964	(211)

Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2993.8280 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	251.8139 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2273.6652 (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	5656.7730 (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	4598.7964	0.2100	965.7472	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2993.8280	0.2100	628.7039	(264)
Space and water heating			1594.4511	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	251.8139	0.1443	36.3445	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-969.7381	0.1344	-130.3262	
PV Unit electricity exported	-1303.9271	0.1258	-163.9842	
Total			-294.3104	(269)
Total CO2, kg/year			1348.4145	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3700	(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	4598.7964	1.1300	5196.6399	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2993.8280	1.1300	3383.0257	(278)
Space and water heating			8579.6655	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	251.8139	1.5338	386.2406	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-969.7381	1.4967	-1451.3913	
PV Unit electricity exported	-1303.9271	0.4616	-601.9255	
Total			-2053.3168	(283)
Total Primary energy kWh/year			7042.6901	(286)
Target Primary Energy Rate (TPER)			54.1700	(287)

Full SAP Calculation Printout

Property Reference	House Type U	Issued on Date	05/10/2023
Assessment Reference	Plot 8	Prop Type Ref	
Property			

SAP Rating	80 C	DER	4.65	TER	13.45
Environmental	96 A	% DER < TER			65.43
CO_2 Emissions (t/year)	0.42	DFEE	41.95	TFEE	48.54
Compliance Check	See BREL	% DFEE < TFEE			13.59
% DPER < TPER	31.03	DPER	48.69	TPER	70.60

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	40.0000 (1b)	x	2.4000 (2b)	=	96.0000 (1b)	-
First floor	37.0000 (1c)	x	2.4000 (2c)	=	88.8000 (1c)	-
Second floor	23.0000 (1d)	x	2.4000 (2d)	=	55.2000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.0000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0417	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2417	(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) =	0.2054	(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	0.2619	0.2568	0.2516	0.2260	0.2208	0.1951	0.1951	0.1900	0.2054	0.2208	0.2311	0.2414	(22b)
Effective ac	0.5343	0.5330	0.5317	0.5255	0.5244	0.5190	0.5190	0.5181	0.5211	0.5244	0.5267	0.5291	(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	
Opening Type 1 (Uw = 1.20)			23.7000	1.1450	27.1374			(27)
Heatloss Floor 1			76.0000	0.1200	9.1200	110.0000	8360.0000	(28a)
External Wall 1	182.0000	23.7000	158.3000	0.1900	30.0770	190.0000	30077.0000	(29a)
External Roof 1	23.0000		23.0000	0.1500	3.4500	9.0000	207.0000	(30)
External Roof 2	2.0000		2.0000	0.1500	0.3000	9.0000	18.0000	(30)
Total net area of external elements Aum(A, m2)			283.0000					(31)

Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 70.0844 (33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 38662.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 386.6200 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	46.0000	0.0670	3.0820
E6 Intermediate floor within a dwelling	66.0000	0.0020	0.1320
E16 Corner (normal)	28.8000	0.0410	1.1808
E2 Other lintels (including other steel lintels)	25.0000	0.0240	0.6000
E3 Sill	20.0000	0.0190	0.3800
E4 Jamb	60.0000	0.0140	0.8400
E10 Eaves (insulation at ceiling level)	20.0000	0.0460	0.9200
E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5308 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 77.6152 (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	42.3164	42.2109	42.1075	41.6219	41.5310	41.1080	41.1080	41.0297	41.2710	41.5310	41.7148	41.9070	(38)
Heat transfer coeff	119.9316	119.8261	119.7227	119.2371	119.1462	118.7232	118.7232	118.6449	118.8862	119.1462	119.3300	119.5222	(39)

Average = Sum(39)m / 12 = 119.2366

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1993	1.1983	1.1972	1.1924	1.1915	1.1872	1.1872	1.1864	1.1889	1.1915	1.1933	1.1952	(40)
HLP (average)												1.1924	
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 2.7395 (42)
Hot water usage for mixer showers

70.1526	69.0984	67.5621	64.6228	62.4536	60.0345	58.6596	60.1842	61.8555	64.4528	67.4553	69.8838	(42a)

Hot water usage for baths

30.2911	29.8413	29.2078	28.0397	27.1651	26.1952	25.6714	26.3005	26.9854	28.0232	29.2153	30.1887	(42b)

Hot water usage for other uses

42.6855	41.1333	39.5811	38.0289	36.4767	34.9245	34.9245	36.4767	38.0289	39.5811	41.1333	42.6855	(42c)

Average daily hot water use (litres/day) 131.5680 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.1293	140.0729	136.3510	130.6913	126.0953	121.1543	119.2554	122.9613	126.8698	132.0570	137.8038	142.7581	(44)
Energy conte	226.6818	199.4620	209.5664	178.9099	169.7486	148.9733	144.2291	152.2518	156.4431	179.2001	196.3268	223.5246	(45)

Energy content (annual) Total = Sum(45)m = 2185.3176

Distribution loss (46)m = 0.15 x (45)m	34.0023	29.9193	31.4350	26.8365	25.4623	22.3460	21.6344	22.8378	23.4665	26.8800	29.4490	33.5287	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

280.0762	247.6892	262.9608	230.5819	223.1430	200.6453	197.6235	205.6462	208.1151	232.5945	247.9988	276.9190	(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 -0.6582	-1.4771	-3.1313	-5.0436	-6.9836	-7.1503	-7.0585	-5.7708	-4.0236	-2.1928	-0.9014	-0.5120	(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

279.4179	246.2121	259.8295	225.5383	216.1594	193.4950	190.5650	199.8755	204.0915	230.4018	247.0974	276.4070	(64)

Total per year (kWh/year) = Sum(64)m = 2769.0903 (64)
12Total per year (kWh/year) 2769 (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

118.0872	104.9029	112.3963	100.8251	99.1569	90.8712	90.6717	93.3392	93.3549	102.2996	106.6163	117.0375	(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	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.2879	143.1402	129.2879	133.5975	129.2879	133.5975	129.2879	129.2879	133.5975	129.2879	133.5975	129.2879	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	256.3278	258.9876	252.2848	238.0153	220.0027	203.0733	191.7634	189.1036	195.8064	210.0759	228.0885	245.0179	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	(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)													

	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	(71)
Water heating gains (Table 5)												
	158.7194	156.1055	151.0703	140.0349	133.2754	126.2100	121.8706	125.4560	129.6596	137.4994	148.0782	157.3084 (72)
Total internal gains												
	608.4279	622.3262	596.7360	575.7407	546.6589	526.9737	507.0148	507.9403	523.1564	540.9561	573.8571	595.7071 (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	6.2000	10.6334	0.7600	0.7000	0.7700	24.3057	(74)
East	9.2000	19.6403	0.7600	0.7000	0.7700	66.6162	(76)
West	8.3000	19.6403	0.7600	0.7000	0.7700	60.0994	(80)

Solar gains	151.0214	294.3321	487.1565	722.1556	900.4395	929.7616	881.8045	746.2572	569.6837	349.4257	187.9837	124.4672 (83)
Total gains	759.4493	916.6583	1083.8925	1297.8963	1447.0984	1456.7353	1388.8193	1254.1976	1092.8401	890.3818	761.8408	720.1744 (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	89.5464	89.6253	89.7027	90.0680	90.1367	90.4578	90.4578	90.5175	90.3338	90.1367	89.9978	89.8532	
alpha	6.9698	6.9750	6.9802	7.0045	7.0091	7.0305	7.0305	7.0345	7.0223	7.0091	6.9999	6.9902	
util living area													
	0.9993	0.9971	0.9856	0.9162	0.7344	0.5190	0.3759	0.4344	0.7229	0.9701	0.9977	0.9995	(86)
Living	20.0746	20.2447	20.5032	20.8112	20.9663	20.9972	20.9997	20.9993	20.9774	20.7205	20.3310	20.0412	
Non living	18.8564	19.0742	19.4003	19.7620	19.9062	19.9293	19.9302	19.9307	19.9188	19.6727	19.1883	18.8162	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5266	20.2447	20.5032	20.8112	20.9663	20.9972	20.9997	20.9993	20.9774	20.7205	20.3310	20.1753	(87)
Th 2	19.9205	19.9214	19.9222	19.9261	19.9268	19.9302	19.9302	19.9309	19.9289	19.9268	19.9254	19.9238	(88)
util rest of house													
	0.9989	0.9955	0.9782	0.8806	0.6624	0.4337	0.2847	0.3339	0.6244	0.9494	0.9962	0.9992	(89)
MIT 2	19.4963	19.0742	19.4003	19.7620	19.9062	19.9293	19.9302	19.9307	19.9188	19.6727	19.1883	19.0158	(90)
Living area fraction									fLA = Living area / (4) =			0.2000	(91)
MIT	19.7024	19.3083	19.6208	19.9719	20.1182	20.1428	20.1441	20.1445	20.1305	19.8823	19.4169	19.2477	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7024	19.3083	19.6208	19.9719	20.1182	20.1428	20.1441	20.1445	20.1305	19.8823	19.4169	19.2477	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9988	0.9943	0.9755	0.8824	0.6759	0.4508	0.3029	0.3541	0.6439	0.9482	0.9951	0.9990	(94)
Useful gains	758.5364	911.4295	1057.3121	1145.2500	978.1039	656.7099	420.7008	444.0671	703.7164	844.2917	758.1322	719.4548	(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													
	1847.2303	1726.4901	1570.8629	1320.1751	1003.0007	658.0641	420.7671	444.2609	716.9426	1105.9468	1469.7715	1798.5357	(97)
Space heating kWh													
	809.9882	547.7207	382.0818	125.9461	18.5232	0.0000	0.0000	0.0000	0.0000	194.6714	512.3803	802.8362	(98a)
Space heating requirement - total per year (kWh/year)												3394.1479	
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													
	809.9882	547.7207	382.0818	125.9461	18.5232	0.0000	0.0000	0.0000	0.0000	194.6714	512.3803	802.8362	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3394.1479	
Space heating per m2											(98c) / (4) =	33.9415	(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 %)	277.4043 (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													
	809.9882	547.7207	382.0818	125.9461	18.5232	0.0000	0.0000	0.0000	0.0000	194.6714	512.3803	802.8362	(98)
Space heating efficiency (main heating system 1)													
	277.4043	277.4043	277.4043	277.4043	277.4043	0.0000	0.0000	0.0000	0.0000	277.4043	277.4043	277.4043	(210)
Space heating fuel (main heating system)													
	291.9883	197.4449	137.7346	45.4016	6.6773	0.0000	0.0000	0.0000	0.0000	70.1760	184.7052	289.4101	(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

279.4179	246.2121	259.8295	225.5383	216.1594	193.4950	190.5650	199.8755	204.0915	230.4018	247.0974	276.4070 (64)

Efficiency of water heater

											148.8191 (216)
(217)m	148.8191	148.8191	148.8191	148.8191	148.8191	148.8191	148.8191	148.8191	148.8191	148.8191	148.8191 (217)

Fuel for water heating, kWh/month

187.7568	165.4439	174.5942	151.5520	145.2497	130.0203	128.0514	134.3077	137.1407	154.8200	166.0388	185.7336 (219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	34.5580	27.7237	24.9621	18.2883	14.1264	11.5414	12.8866	16.7505	21.7572	28.5467	32.2434	35.5185 (232)

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

(233a)m	-7.2754	-11.6334	-18.8826	-23.7954	-28.0295	-27.0884	-26.7265	-23.9129	-19.4282	-14.2497	-8.4393	-6.1341 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

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

(233b)m	-0.0071	-0.0981	-0.4136	-1.1241	-1.9202	-2.0410	-2.0149	-1.6390	-1.1352	-0.4092	-0.0646	-0.0032 (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	1223.5382 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	148.8191
Water heating fuel used	1860.7090 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	278.9028 (232)

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

PV generation	-226.4657 (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	3136.6843 (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	1223.5382	0.1571	192.2408	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1860.7090	0.1411	262.6249	(264)
Space and water heating			454.8657	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	278.9028	0.1443	40.2543	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-215.5954	0.1323	-28.5168	
PV Unit electricity exported	-10.8703	0.1158	-1.2592	
Total			-29.7760	(269)
Total CO2, kg/year			465.3440	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6500	(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	1223.5382	1.5816	1935.1859	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1860.7090	1.5219	2831.8227	(278)
Space and water heating			4767.0087	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	278.9028	1.5338	427.7904	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-215.5954	1.4887	-320.9602	
PV Unit electricity exported	-10.8703	0.4248	-4.6173	
Total			-325.5775	(283)
Total Primary energy kWh/year			4869.2216	(286)
Dwelling Primary energy Rate (DPER)			48.6900	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	40.0000 (1b)	x	2.4000 (2b)	=	96.0000 (1b)	-
First floor	37.0000 (1c)	x	2.4000 (2c)	=	88.8000 (1c)	-
Second floor	23.0000 (1d)	x	2.4000 (2d)	=	55.2000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.0000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	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) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(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) =	0.3187	(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	0.4064	0.3984	0.3905	0.3506	0.3427	0.3028	0.3028	0.2948	0.3187	0.3427	0.3586	0.3745	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5458	0.5458	0.5435	0.5508	0.5587	0.5643	0.5701	(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 Opening Type (Uw = 1.20)			23.7000	1.1450	27.1374			(27)
Heatloss Floor 1			76.0000	0.1300	9.8800			(28a)
External Wall 1	182.0000	23.7000	158.3000	0.1800	28.4940			(29a)
External Roof 1	23.0000		23.0000	0.1100	2.5300			(30)
External Roof 2	2.0000		2.0000	0.1100	0.2200			(30)
Total net area of external elements Aum(A, m2)			283.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.2614			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							386.6200	(35)

List of Thermal Bridges

	Length	Psi-value	Total
E5 Ground floor (normal)	46.0000	0.1600	7.3600
E6 Intermediate floor within a dwelling	66.0000	0.0000	0.0000
E16 Corner (normal)	28.8000	0.0900	2.5920
E2 Other lintels (including other steel lintels)	25.0000	0.0500	1.2500
E3 Sill	20.0000	0.0500	1.0000
E4 Jamb	60.0000	0.0500	3.0000
E10 Eaves (insulation at ceiling level)	20.0000	0.0600	1.2000
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		17.1220	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	85.3834	(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	46.1406	45.8866	45.6376	44.4683	44.2496	43.2311	43.2311	43.0425	43.6234	44.2496	44.6921	45.1548	(38)
Heat transfer coeff													
	131.5240	131.2700	131.0211	129.8517	129.6330	128.6145	128.6145	128.4259	129.0068	129.6330	130.0755	130.5382	(39)
Average = Sum(39)m / 12 =												129.8507	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3152	1.3127	1.3102	1.2985	1.2963	1.2861	1.2861	1.2843	1.2901	1.2963	1.3008	1.3054	(40)
HLP (average)												1.2985	
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												2.7395	(42)
Hot water usage for mixer showers													
	70.1526	69.0984	67.5621	64.6228	62.4536	60.0345	58.6596	60.1842	61.8555	64.4528	67.4553	69.8838	(42a)
Hot water usage for baths													
	30.2911	29.8413	29.2078	28.0397	27.1651	26.1952	25.6714	26.3005	26.9854	28.0232	29.2153	30.1887	(42b)
Hot water usage for other uses													
	42.6855	41.1333	39.5811	38.0289	36.4767	34.9245	34.9245	36.4767	38.0289	39.5811	41.1333	42.6855	(42c)
Average daily hot water use (litres/day)												131.5680	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	143.1293	140.0729	136.3510	130.6913	126.0953	121.1543	119.2554	122.9613	126.8698	132.0570	137.8038	142.7581	(44)
Energy conte	226.6818	199.4620	209.5664	178.9099	169.7486	148.9733	144.2291	152.2518	156.4431	179.2001	196.3268	223.5246	(45)
Energy content (annual)										Total = Sum(45)m =		2185.3176	
Distribution loss (46)m = 0.15 x (45)m													
	34.0023	29.9193	31.4350	26.8365	25.4623	22.3460	21.6344	22.8378	23.4665	26.8800	29.4490	33.5287	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	273.2767	241.5477	256.1613	224.0018	216.3435	194.0651	190.8240	198.8467	201.5349	225.7950	241.4187	270.1195	(62)
WWHRS	-32.0709	-28.3637	-29.7009	-24.5935	-22.9202	-19.6130	-18.3841	-19.5496	-20.2924	-23.9225	-27.1013	-31.4769	(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													
	241.2058	213.1840	226.4604	199.4083	193.4232	174.4521	172.4399	179.2971	181.2426	201.8726	214.3174	238.6426	(64)
										Total per year (kWh/year) = Sum(64)m =		2435.9460	(64)
12Total per year (kWh/year)												2436	(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													
	112.6476	99.9897	106.9567	95.5610	93.7173	85.6071	85.2321	87.8997	88.0908	96.8600	101.3521	111.5979	(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	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	129.2879	143.1402	129.2879	133.5975	129.2879	133.5975	129.2879	129.2879	133.5975	129.2879	133.5975	129.2879	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	256.3278	258.9876	252.2848	238.0153	220.0027	203.0733	191.7634	189.1036	195.8064	210.0759	228.0885	245.0179	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	(71)
Water heating gains (Table 5)													
	151.4081	148.7942	143.7591	132.7236	125.9641	118.8987	114.5593	118.1447	122.3483	130.1881	140.7669	149.9971	(72)
Total internal gains													
	604.1167	618.0149	592.4247	571.4294	542.3476	519.6625	499.7035	500.6291	515.8451	536.6448	569.5458	591.3959	(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	6.2000	10.6334	0.6300	0.7000	0.7700	20.1482	(74)
East	9.2000	19.6403	0.6300	0.7000	0.7700	55.2213	(76)
West	8.3000	19.6403	0.6300	0.7000	0.7700	49.8193	(80)

Solar gains	125.1888	243.9859	403.8271	598.6290	746.4169	770.7234	730.9695	618.6080	472.2378	289.6555	155.8286	103.1768	(83)
Total gains	729.3054	862.0008	996.2518	1170.0584	1288.7645	1290.3859	1230.6730	1119.2370	988.0829	826.3003	725.3744	694.5726	(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	81.6539	81.8119	81.9673	82.7054	82.8450	83.5010	83.5010	83.6236	83.2471	82.8450	82.5631	82.2705	
alpha	6.4436	6.4541	6.4645	6.5137	6.5230	6.5667	6.5667	6.5749	6.5498	6.5230	6.5042	6.4847	
util living area	0.9995	0.9982	0.9926	0.9580	0.8365	0.6254	0.4583	0.5241	0.8182	0.9837	0.9984	0.9996	(86)
MIT	19.9240	20.0810	20.3317	20.6692	20.9062	20.9882	20.9986	20.9969	20.9399	20.6066	20.2039	19.8998	(87)
Th 2	19.8289	19.8309	19.8328	19.8420	19.8437	19.8517	19.8517	19.8532	19.8486	19.8437	19.8402	19.8366	(88)
util rest of house	0.9992	0.9972	0.9884	0.9351	0.7673	0.5199	0.3396	0.3957	0.7183	0.9707	0.9974	0.9994	(89)
MIT 2	18.5930	18.7953	19.1154	19.5340	19.7806	19.8473	19.8515	19.8526	19.8185	19.4701	18.9602	18.5678	(90)
Living area fraction										fLA = Living area / (4) =		0.2000	(91)
MIT	18.8592	19.0525	19.3586	19.7610	20.0058	20.0755	20.0809	20.0815	20.0428	19.6974	19.2090	18.8342	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8592	19.0525	19.3586	19.7610	20.0058	20.0755	20.0809	20.0815	20.0428	19.6974	19.2090	18.8342	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9988	0.9962	0.9860	0.9331	0.7781	0.5411	0.3635	0.4216	0.7372	0.9684	0.9965	0.9991	(94)
Useful gains	728.4066	858.7371	982.3381	1091.7600	1002.7358	698.1702	447.3237	471.8491	728.4238	800.2085	722.8417	693.9469	(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	1914.8816	1857.7957	1684.7527	1410.3215	1076.7003	704.2290	447.6960	472.7959	766.6616	1179.3240	1575.0808	1910.3226	(97)
Space heating kWh	882.7374	671.3674	522.5965	229.3643	55.0296	0.0000	0.0000	0.0000	0.0000	282.0619	613.6121	904.9835	(98a)
Space heating requirement - total per year (kWh/year)												4161.7528	
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	882.7374	671.3674	522.5965	229.3643	55.0296	0.0000	0.0000	0.0000	0.0000	282.0619	613.6121	904.9835	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4161.7528	
Space heating per m2											(98c) / (4) =	41.6175	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	882.7374	671.3674	522.5965	229.3643	55.0296	0.0000	0.0000	0.0000	0.0000	282.0619	613.6121	904.9835	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	956.3786	727.3753	566.1934	248.4987	59.6203	0.0000	0.0000	0.0000	0.0000	305.5925	664.8019	980.4805	(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	241.2058	213.1840	226.4604	199.4083	193.4232	174.4521	172.4399	179.2971	181.2426	201.8726	214.3174	238.6426	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.7015	86.4502	85.8720	84.3745	81.6325	79.8000	79.8000	79.8000	79.8000	84.8100	86.2811	86.7582	(217)
Fuel for water heating, kWh/month	278.2026	246.5975	263.7185	236.3373	236.9439	218.6117	216.0901	224.6831	227.1210	238.0293	248.3945	275.0663	(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	26.8635	21.5509	19.4042	14.2163	10.9811	8.9717	10.0173	13.0209	16.9129	22.1906	25.0642	27.6101	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.4808	-54.8091	-79.5789	-90.3942	-98.2255	-91.9154	-90.7373	-85.2643	-75.7693	-63.0405	-42.4857	-33.2003	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-20.0870	-42.4327	-84.6768	-127.6870	-169.3483	-170.3779	-168.4183	-142.4069	-104.0940	-60.9066	-26.8885	-15.8749	(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	4508.9413 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2909.7959 (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)	216.8036 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1977.1002 (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	5744.4406 (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	4508.9413	0.2100	946.8777	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2909.7959	0.2100	611.0571	(264)
Space and water heating			1557.9348	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.8036	0.1443	31.2915	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-843.9012	0.1344	-113.4052	
PV Unit electricity exported	-1133.1990	0.1258	-142.5251	
Total			-255.9303	(269)
Total CO2, kg/year			1345.2253	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.4500	(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	4508.9413	1.1300	5095.1036	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2909.7959	1.1300	3288.0694	(278)
Space and water heating			8383.1730	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.8036	1.5338	332.5407	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-843.9012	1.4966	-1263.0179	
PV Unit electricity exported	-1133.1990	0.4617	-523.1581	
Total			-1786.1760	(283)
Total Primary energy kWh/year			7059.6386	(286)
Target Primary Energy Rate (TPER)			70.6000	(287)

Full SAP Calculation Printout

Property Reference	House Type J	Issued on Date	05/10/2023
Assessment Reference	Plot 9	Prop Type Ref	
Property			

SAP Rating	82 B	DER	3.90	TER	9.39
Environmental	96 A	% DER < TER			58.47
CO_2 Emissions (t/year)	0.45	DFEE	35.82	TFEE	39.48
Compliance Check	See BREL	% DFEE < TFEE			9.26
% DPER < TPER	16.53	DPER	40.93	TPER	49.03

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	70.0000 (1b)	x	2.4000 (2b)	=	168.0000 (1b)	-
First floor	56.0000 (1c)	x	2.4000 (2c)	=	134.4000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	302.4000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0331	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2331	(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) =	0.1981	(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	0.2526	0.2476	0.2427	0.2179	0.2130	0.1882	0.1882	0.1833	0.1981	0.2130	0.2229	0.2328	(22b)
Effective ac	0.5319	0.5307	0.5294	0.5237	0.5227	0.5177	0.5177	0.5168	0.5196	0.5227	0.5248	0.5271	(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	
Opening Type 1 (Uw = 1.20)			35.5000	1.1450	40.6489			(27)
Heatloss Floor 1			70.0000	0.1200	8.4000	110.0000	7700.0000	(28a)
External Wall 1	172.0000	35.5000	136.5000	0.1900	25.9350	190.0000	25935.0000	(29a)
External Roof 1	14.0000		14.0000	0.1500	2.1000	9.0000	126.0000	(30)
External Roof 2	56.0000		56.0000	0.1500	8.4000	9.0000	504.0000	(30)
Total net area of external elements Aum(A, m2)			312.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	85.4839			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 34265.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 271.9444 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	40.0000	0.0670	2.6800
E6 Intermediate floor within a dwelling	32.0000	0.0020	0.0640
E2 Other lintels (including other steel lintels)	19.7000	0.0240	0.4728
E3 Sill	14.3000	0.0190	0.2717
E4 Jamb	43.9000	0.0140	0.6146
E10 Eaves (insulation at ceiling level)	18.0000	0.0460	0.8280
E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3271 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 90.8110 (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	53.0794	52.9558	52.8346	52.2655	52.1590	51.6633	51.6633	51.5715	51.8543	52.1590	52.3744	52.5996	(38)
Heat transfer coeff	143.8904	143.7667	143.6456	143.0765	142.9700	142.4743	142.4743	142.3825	142.6652	142.9700	143.1854	143.4106	(39)

Average = Sum(39)m / 12 = 143.0759

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1420	1.1410	1.1400	1.1355	1.1347	1.1307	1.1307	1.1300	1.1323	1.1347	1.1364	1.1382	(40)
HLP (average)												1.1355	
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 2.8838 (42)
Hot water usage for mixer showers

72.5718	71.4812	69.8920	66.8513	64.6073	62.1048	60.6824	62.2596	63.9886	66.6754	69.7815	72.2938	(42a)

Hot water usage for baths

31.3315	30.8662	30.2109	29.0027	28.0980	27.0949	26.5531	27.2037	27.9122	28.9856	30.2187	31.2256	(42b)

Hot water usage for other uses

44.1631	42.5572	40.9512	39.3453	37.7394	36.1334	36.1334	37.7394	39.3453	40.9512	42.5572	44.1631	(42c)

Average daily hot water use (litres/day) 136.1063 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.0664	144.9046	141.0541	135.1993	130.4447	125.3332	123.3689	127.2028	131.2461	136.6123	142.5573	147.6825	(44)
Energy conte	234.5010	206.3422	216.7950	185.0811	175.6037	154.1118	149.2040	157.5036	161.8395	185.3816	203.0990	231.2350	(45)

Energy content (annual) Total = Sum(45)m = 2260.6975

Distribution loss (46)m = 0.15 x (45)m	35.1752	30.9513	32.5192	27.7622	26.3405	23.1168	22.3806	23.6255	24.2759	27.8072	30.4649	34.6853	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

287.8954	254.5694	270.1894	236.7531	228.9981	205.7838	202.5984	210.8980	213.5115	238.7760	254.7710	284.6294	(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

287.8954	254.5694	270.1894	236.7531	228.9981	205.7838	202.5984	210.8980	213.5115	238.7760	254.7710	284.6294	(64)

Total per year (kWh/year) = Sum(64)m = 2889.3735 (64)
12Total per year (kWh/year) 2889 (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

120.6871	107.1905	114.7998	102.8771	101.1037	92.5798	92.3259	95.0855	95.1492	104.3549	108.8680	119.6012	(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	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	147.7001	163.5251	147.7001	152.6234	147.7001	152.6234	147.7001	147.7001	152.6234	147.7001	152.6234	147.7001	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	292.8319	295.8706	288.2132	271.9116	251.3337	231.9934	219.0729	216.0342	223.6916	239.9932	260.5711	279.9114	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	(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)													
	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	(71)
Water heating gains (Table 5)													

	162.2139	159.5097	154.3009	142.8848	135.8921	128.5830	124.0939	127.8030	132.1517	140.2620	151.2056	160.7543 (72)
Total internal gains	669.0030	685.1626	656.4713	633.6770	601.1831	579.4570	557.1240	557.7945	574.7239	594.2124	630.6573	654.6229 (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	11.9000	10.6334	0.7600	0.7000	0.7700	46.6513 (74)
East	7.1000	19.6403	0.7600	0.7000	0.7700	51.4103 (76)
South	11.8000	46.7521	0.7600	0.7000	0.7700	203.3891 (78)
West	4.7000	19.6403	0.7600	0.7000	0.7700	34.0322 (80)

Solar gains	335.4829	589.3957	851.0636	1124.3506	1319.5245	1335.4853	1277.0078	1128.1345	945.5252	663.7336	405.1726	284.9015 (83)
Total gains	1004.4860	1274.5583	1507.5350	1758.0275	1920.7075	1914.9423	1834.1318	1685.9290	1520.2491	1257.9460	1035.8299	939.5244 (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	66.1480	66.2048	66.2607	66.5243	66.5738	66.8054	66.8054	66.8485	66.7160	66.5738	66.4737	66.3693	
alpha	5.4099	5.4137	5.4174	5.4350	5.4383	5.4537	5.4537	5.4566	5.4477	5.4383	5.4316	5.4246	
util living area	0.9948	0.9818	0.9452	0.8380	0.6605	0.4718	0.3411	0.3871	0.6248	0.9059	0.9860	0.9963	(86)
Living	19.8817	20.1528	20.4756	20.7943	20.9513	20.9933	20.9991	20.9982	20.9724	20.7230	20.2273	19.8256	
Non living	18.6819	19.0244	19.4211	19.7855	19.9378	19.9726	19.9756	19.9759	19.9592	19.7213	19.1245	18.6126	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	6	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	25	10	0	0	0	0	0	0	0	0	0	31	
MIT	20.4892	20.2840	20.4756	20.7943	20.9513	20.9933	20.9991	20.9982	20.9724	20.7230	20.2273	20.3348	(87)
Th 2	19.9667	19.9675	19.9683	19.9719	19.9726	19.9758	19.9758	19.9764	19.9746	19.9726	19.9712	19.9698	(88)
util rest of house	0.9930	0.9759	0.9284	0.7975	0.5981	0.3983	0.2621	0.3017	0.5414	0.8701	0.9804	0.9950	(89)
MIT 2	19.5094	19.2126	19.4211	19.7855	19.9378	19.9726	19.9756	19.9759	19.9592	19.7213	19.1245	19.3708	(90)
Living area fraction										fLA = Living area / (4) =		0.1429	(91)
MIT	19.6493	19.3656	19.5718	19.9296	20.0826	20.1184	20.1218	20.1219	20.1040	19.8644	19.2821	19.5085	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6493	19.3656	19.5718	19.9296	20.0826	20.1184	20.1218	20.1219	20.1040	19.8644	19.2821	19.5085	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9923	0.9714	0.9206	0.7956	0.6050	0.4087	0.2734	0.3139	0.5524	0.8656	0.9752	0.9942	(94)
Useful gains	996.7207	1238.1419	1387.8249	1398.7507	1162.0430	782.6114	501.4514	529.2764	839.7163	1088.8882	1010.1180	934.1211	(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	2208.6214	2079.6776	1877.7014	1578.0804	1198.4547	786.2333	501.7616	529.9341	856.5561	1324.5356	1744.2934	2195.3996	(97)
Space heating kWh	901.6541	565.5119	364.4682	129.1174	27.0903	0.0000	0.0000	0.0000	0.0000	175.3217	528.6063	938.3912	(98a)
Space heating requirement - total per year (kWh/year)												3630.1611	
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	901.6541	565.5119	364.4682	129.1174	27.0903	0.0000	0.0000	0.0000	0.0000	175.3217	528.6063	938.3912	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3630.1611	
Space heating per m2											(98c) / (4) =	28.8108	(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 %) 294.4427 (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	901.6541	565.5119	364.4682	129.1174	27.0903	0.0000	0.0000	0.0000	0.0000	175.3217	528.6063	938.3912	(98)
Space heating efficiency (main heating system 1)	294.4427	294.4427	294.4427	294.4427	294.4427	0.0000	0.0000	0.0000	0.0000	294.4427	294.4427	294.4427	(210)
Space heating fuel (main heating system)	306.2240	192.0618	123.7824	43.8514	9.2005	0.0000	0.0000	0.0000	0.0000	59.5436	179.5277	318.7008	(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												
	287.8954	254.5694	270.1894	236.7531	228.9981	205.7838	202.5984	210.8980	213.5115	238.7760	254.7710	284.6294 (64)
Efficiency of water heater												162.1807 (216)
(217)m	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807 (217)
Fuel for water heating, kWh/month												
	177.5152	156.9665	166.5977	145.9810	141.1993	126.8855	124.9214	130.0389	131.6504	147.2284	157.0908	175.5014 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	39.9803	32.0737	28.8788	21.1579	16.3429	13.3523	14.9086	19.3787	25.1711	33.0258	37.3026	41.0915 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1232.8922 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	162.1807
Water heating fuel used	1781.5767 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	322.6643 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	3337.1332 (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	1232.8922	0.1575	194.2232	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1781.5767	0.1410	251.1214	(264)
Space and water heating			445.3446	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	322.6643	0.1443	46.5704	(268)
Total CO2, kg/year			491.9150	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.9000	(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	1232.8922	1.5831	1951.8438	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1781.5767	1.5212	2710.1376	(278)
Space and water heating			4661.9813	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	322.6643	1.5338	494.9133	(282)
Total Primary energy kWh/year			5156.8946	(286)
Dwelling Primary energy Rate (DPER)			40.9300	(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	70.0000 (1b)	x	2.4000 (2b)	=	168.0000 (1b)	-
First floor	56.0000 (1c)	x	2.4000 (2c)	=	134.4000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	302.4000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1323 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3823 (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) =	0.3249 (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	0.4143	0.4062	0.3980	0.3574	0.3493	0.3087	0.3087	0.3006	0.3249	0.3493	0.3656	0.3818	(22b)
Effective ac	0.5858	0.5825	0.5792	0.5639	0.5610	0.5476	0.5476	0.5452	0.5528	0.5610	0.5668	0.5729	(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 Opening Type (Uw = 1.20)			31.5000	1.1450	36.0687			(27)
Heatloss Floor 1			70.0000	0.1300	9.1000			(28a)
External Wall 1	172.0000	31.5000	140.5000	0.1800	25.2900			(29a)
External Roof 1	14.0000		14.0000	0.1100	1.5400			(30)
External Roof 2	56.0000		56.0000	0.1100	6.1600			(30)
Total net area of external elements Aum(A, m2)			312.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.1587			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			271.9444 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	40.0000	0.1600	6.4000
E6 Intermediate floor within a dwelling	32.0000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	19.7000	0.0500	0.9850
E3 Sill	14.3000	0.0500	0.7150
E4 Jamb	43.9000	0.0500	2.1950
E10 Eaves (insulation at ceiling level)	18.0000	0.0600	1.0800
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.0950 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	90.2537 (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	58.4600	58.1274	57.8015	56.2704	55.9840	54.6505	54.6505	54.4035	55.1641	55.9840	56.5635	57.1693	(38)
Heat transfer coeff	148.7137	148.3811	148.0552	146.5241	146.2377	144.9042	144.9042	144.6572	145.4178	146.2377	146.8172	147.4230	(39)

Average = Sum(39)m / 12 = 146.5228

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1803	1.1776	1.1750	1.1629	1.1606	1.1500	1.1500	1.1481	1.1541	1.1606	1.1652	1.1700	(40)
HLP (average)												1.1629	
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 2.8838 (42)

Hot water usage for mixer showers

	72.5718	71.4812	69.8920	66.8513	64.6073	62.1048	60.6824	62.2596	63.9886	66.6754	69.7815	72.2938 (42a)

Hot water usage for baths

	31.3315	30.8662	30.2109	29.0027	28.0980	27.0949	26.5531	27.2037	27.9122	28.9856	30.2187	31.2256 (42b)

Hot water usage for other uses

	44.1631	42.5572	40.9512	39.3453	37.7394	36.1334	36.1334	37.7394	39.3453	40.9512	42.5572	44.1631 (42c)

Average daily hot water use (litres/day) 136.1063 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.0664	144.9046	141.0541	135.1993	130.4447	125.3332	123.3689	127.2028	131.2461	136.6123	142.5573	147.6825	(44)
Energy conte	234.5010	206.3422	216.7950	185.0811	175.6037	154.1118	149.2040	157.5036	161.8395	185.3816	203.0990	231.2350	(45)
Energy content (annual)										Total = Sum(45)m =		2260.6975	
Distribution loss (46)m = 0.15 x (45)m													
	35.1752	30.9513	32.5192	27.7622	26.3405	23.1168	22.3806	23.6255	24.2759	27.8072	30.4649	34.6853	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	281.0959	248.4279	263.3899	230.1729	222.1986	199.2036	195.7989	204.0985	206.9314	231.9765	248.1909	277.8299	(62)
WWHRS	-33.1768	-29.3418	-30.7251	-25.4416	-23.7107	-20.2894	-19.0181	-20.2238	-20.9922	-24.7474	-28.0359	-32.5624	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	247.9191	219.0860	232.6648	204.7313	198.4879	178.9142	176.7809	183.8747	185.9392	207.2290	220.1550	245.2675	(64)
										Total per year (kWh/year) = Sum(64)m =		2501.0498	(64)
12Total per year (kWh/year)												2501	(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													
	115.2475	102.2773	109.3602	97.6129	95.6641	87.3156	86.8863	89.6459	89.8851	98.9153	103.6039	114.1616	(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	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	147.7001	163.5251	147.7001	152.6234	147.7001	152.6234	147.7001	147.7001	152.6234	147.7001	152.6234	147.7001	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	292.8319	295.8706	288.2132	271.9116	251.3337	231.9934	219.0729	216.0342	223.6916	239.9932	260.5711	279.9114	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	(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)													
	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	(71)
Water heating gains (Table 5)													
	154.9026	152.1984	146.9896	135.5735	128.5808	121.2717	116.7826	120.4918	124.8404	132.9507	143.8943	153.4430	(72)
Total internal gains													
	664.6917	680.8513	652.1600	629.3657	596.8718	572.1457	549.8127	550.4832	567.4126	589.9011	626.3460	650.3116	(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	10.5600	10.6334	0.6300	0.7000	0.7700	34.3169	(74)
East	6.3000	19.6403	0.6300	0.7000	0.7700	37.8146	(76)
South	10.4700	46.7521	0.6300	0.7000	0.7700	149.5958	(78)
West	4.1700	19.6403	0.6300	0.7000	0.7700	25.0297	(80)

Solar gains	246.7569	433.5174	625.9836	826.9984	970.5593	982.3008	939.2876	829.7831	695.4643	488.1955	298.0157	209.5528	(83)
Total gains	911.4487	1114.3687	1278.1437	1456.3641	1567.4311	1554.4465	1489.1004	1380.2662	1262.8768	1078.0966	924.3617	859.8644	(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	64.0026	64.1460	64.2872	64.9590	65.0862	65.6852	65.6852	65.7973	65.4532	65.0862	64.8293	64.5629	
alpha	5.2668	5.2764	5.2858	5.3306	5.3391	5.3790	5.3790	5.3865	5.3635	5.3391	5.3220	5.3042	
util living area	0.9968	0.9904	0.9729	0.9121	0.7770	0.5811	0.4256	0.4771	0.7327	0.9477	0.9919	0.9976	(86)
MIT	19.7534	19.9823	20.2844	20.6471	20.8871	20.9808	20.9970	20.9946	20.9379	20.6036	20.1082	19.7164	(87)
Th 2	19.9358	19.9379	19.9400	19.9498	19.9516	19.9602	19.9602	19.9618	19.9569	19.9516	19.9479	19.9441	(88)
util rest of house	0.9956	0.9870	0.9633	0.8830	0.7157	0.4936	0.3264	0.3721	0.6455	0.9236	0.9884	0.9967	(89)
MIT 2	18.4959	18.7883	19.1688	19.6106	19.8651	19.9506	19.9594	19.9601	19.9197	19.5728	18.9576	18.4546	(90)
Living area fraction										fLA = Living area / (4) =		0.1429	(91)
MIT	18.6755	18.9588	19.3282	19.7586	20.0111	20.0977	20.1076	20.1079	20.0651	19.7200	19.1219	18.6349	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6755	18.9588	19.3282	19.7586	20.0111	20.0977	20.1076	20.1079	20.0651	19.7200	19.1219	18.6349	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9935	0.9826	0.9560	0.8768	0.7195	0.5055	0.3406	0.3871	0.6553	0.9169	0.9845	0.9951	(94)
Useful gains	905.5539	1095.0026	1221.9647	1276.9229	1127.7205	785.8361	507.2315	534.3537	827.5533	988.4859	910.0377	855.6610	(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	2137.8340	2086.0681	1899.2784	1591.0516	1215.3984	796.6458	508.2645	536.3754	867.4339	1333.6933	1765.0269	2128.0348	(97)
Space heating kWh	916.8164	665.9960	503.9213	226.1727	65.2323	0.0000	0.0000	0.0000	0.0000	256.8343	615.5923	946.6461	(98a)
Space heating requirement - total per year (kWh/year)												4197.2114	
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	916.8164	665.9960	503.9213	226.1727	65.2323	0.0000	0.0000	0.0000	0.0000	256.8343	615.5923	946.6461	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4197.2114	
Space heating per m2										(98c) / (4) =		33.3112	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	916.8164	665.9960	503.9213	226.1727	65.2323	0.0000	0.0000	0.0000	0.0000	256.8343	615.5923	946.6461	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	993.3005	721.5558	545.9603	245.0408	70.6742	0.0000	0.0000	0.0000	0.0000	278.2604	666.9472	1025.6187	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	247.9191	219.0860	232.6648	204.7313	198.4879	178.9142	176.7809	183.8747	185.9392	207.2290	220.1550	245.2675	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.7182	86.3883	85.7454	84.2837	81.8520	79.8000	79.8000	79.8000	79.8000	84.5422	86.2379	86.7859	(217)
Fuel for water heating, kWh/month	285.8904	253.6062	271.3438	242.9075	242.4961	224.2033	221.5299	230.4194	233.0065	245.1191	255.2879	282.6122	(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	30.6892	24.6200	22.1676	16.2409	12.5449	10.2493	11.4439	14.8752	19.3215	25.3508	28.6337	31.5421	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-60.6550	-83.1566	-116.2561	-126.9780	-133.7906	-123.6817	-122.0263	-116.6195	-106.7695	-93.1608	-65.7865	-52.7097	(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	-41.8388	-87.0165	-171.1912	-254.6641	-334.4635	-335.3316	-331.4959	-281.8051	-207.9915	-123.7466	-55.6184	-33.1719	(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												4547.3580	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	79.8000
Water heating fuel used	2988.4225 (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)	247.6791 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3459.9254 (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	4409.5341 (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	4547.3580	0.2100	954.9452	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2988.4225	0.2100	627.5687	(264)
Space and water heating			1582.5139	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	247.6791	0.1443	35.7477	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1201.5903	0.1352	-162.4665	
PV Unit electricity exported	-2258.3350	0.1262	-284.9425	
Total			-447.4090	(269)
Total CO2, kg/year			1182.7819	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3900	(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	4547.3580	1.1300	5138.5145	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2988.4225	1.1300	3376.9174	(278)
Space and water heating			8515.4319	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	247.6791	1.5338	379.8985	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1201.5903	1.4997	-1802.0807	
PV Unit electricity exported	-2258.3350	0.4632	-1045.9621	
Total			-2848.0428	(283)
Total Primary energy kWh/year			6177.3884	(286)
Target Primary Energy Rate (TPER)			49.0300	(287)

Full SAP Calculation Printout

Property Reference	House Type L	Issued on Date	05/10/2023
Assessment Reference	Plot 10	Prop Type Ref	
Property			

SAP Rating	82 B	DER	3.62	TER	9.20
Environmental	96 A	% DER < TER			60.65
CO_2 Emissions (t/year)	0.48	DFEE	37.09	TFEE	41.08
Compliance Check	See BREL	% DFEE < TFEE			9.70
% DPER < TPER	21.45	DPER	37.84	TPER	48.18

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	80.0000 (1b)	x	2.4000 (2b)	=	192.0000 (1b)	-
First floor	65.0000 (1c)	x	2.4000 (2c)	=	156.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	348.0000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0287	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2287	(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) =	0.1944	(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	0.2479	0.2430	0.2382	0.2139	0.2090	0.1847	0.1847	0.1798	0.1944	0.2090	0.2187	0.2284	(22b)
Effective ac	0.5307	0.5295	0.5284	0.5229	0.5218	0.5171	0.5171	0.5162	0.5189	0.5218	0.5239	0.5261	(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	
Opening Type 1 (Uw = 1.20)			42.3000	1.1450	48.4351			(27)
Heatloss Floor 1			80.0000	0.1200	9.6000	110.0000	8800.0000	(28a)
External Wall 1	192.0000	42.3000	149.7000	0.1900	28.4430	190.0000	28443.0000	(29a)
External Roof 1	65.0000		65.0000	0.1500	9.7500	9.0000	585.0000	(30)
External Roof 2	16.0000		16.0000	0.1500	2.4000	9.0000	144.0000	(30)
Total net area of external elements Aum(A, m2)			353.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		98.6281			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 37972.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 261.8759 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	45.0000	0.0670	3.0150
E6 Intermediate floor within a dwelling	35.0000	0.0020	0.0700
E16 Corner (normal)	19.2000	0.0410	0.7872
E2 Other lintels (including other steel lintels)	26.6000	0.0240	0.6384
E3 Sill	21.4000	0.0190	0.4066
E4 Jamb	55.5400	0.0140	0.7776
E10 Eaves (insulation at ceiling level)	23.0000	0.0460	1.0580
E12 Gable (insulation at ceiling level)	10.0000	0.0330	0.3300

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.0828 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 105.7109 (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	60.9485	60.8115	60.6772	60.0464	59.9283	59.3789	59.3789	59.2772	59.5905	59.9283	60.1671	60.4167	(38)
Heat transfer coeff	166.6594	166.5224	166.3880	165.7572	165.6392	165.0898	165.0898	164.9880	165.3014	165.6392	165.8780	166.1276	(39)

Average = Sum(39)m / 12 = 165.7567

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1494	1.1484	1.1475	1.1432	1.1423	1.1386	1.1386	1.1378	1.1400	1.1423	1.1440	1.1457	(40)
HLP (average)												1.1431	
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 2.9261 (42)
Hot water usage for mixer showers

73.2803	72.1790	70.5742	67.5038	65.2380	62.7111	61.2748	62.8674	64.6132	67.3263	70.4626	72.9995	(42a)

Hot water usage for baths

31.6361	31.1663	30.5047	29.2847	28.3712	27.3583	26.8112	27.4682	28.1836	29.2674	30.5125	31.5292	(42b)

Hot water usage for other uses

44.5958	42.9741	41.3525	39.7308	38.1091	36.4875	36.4875	38.1091	39.7308	41.3525	42.9741	44.5958	(42c)

Average daily hot water use (litres/day) 137.4352 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.5122	146.3194	142.4313	136.5193	131.7183	126.5569	124.5735	128.4448	132.5276	137.9462	143.9493	149.1244	(44)
Energy conte	236.7907	208.3569	218.9117	186.8882	177.3182	155.6164	150.6608	159.0414	163.4197	187.1917	205.0821	233.4928	(45)

Energy content (annual) Total = Sum(45)m = 2282.7706

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

35.5186	31.2535	32.8368	28.0332	26.5977	23.3425	22.5991	23.8562	24.5130	28.0787	30.7623	35.0239	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
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)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

290.1851	256.5841	272.3061	238.5602	230.7126	207.2884	204.0552	212.4358	215.0917	240.5861	256.7541	286.8872	(62)
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)
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)
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)
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)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

290.1851	256.5841	272.3061	238.5602	230.7126	207.2884	204.0552	212.4358	215.0917	240.5861	256.7541	286.8872	(64)

Total per year (kWh/year) = Sum(64)m = 2911.4466 (64)
12Total per year (kWh/year) 2911 (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

121.4484	107.8604	115.5036	103.4779	101.6738	93.0801	92.8102	95.5968	95.6747	104.9567	109.5274	120.3519	(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	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.8959	175.9204	158.8959	164.1924	158.8959	164.1924	158.8959	158.8959	164.1924	158.8959	164.1924	158.8959	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	315.0288	318.2978	310.0600	292.5227	270.3850	249.5787	235.6787	232.4097	240.6475	258.1849	280.3226	301.1289	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	(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)													
	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	(71)

Water heating gains (Table 5)

	163.2371	160.5066	155.2468	143.7193	136.6584	129.2779	124.7450	128.4903	132.8815	141.0709	152.1214	161.7633 (72)

Total internal gains

	704.0527	721.6157	691.0936	667.3253	632.8301	609.9398	586.2105	586.6868	604.6123	625.0425	663.5272	688.6790 (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	11.7500	10.6334	0.7600	0.7000	0.7700	46.0632 (74)
East	4.1500	19.6403	0.7600	0.7000	0.7700	30.0497 (76)
South	12.4000	46.7521	0.7600	0.7000	0.7700	213.7309 (78)
West	14.0000	19.6403	0.7600	0.7000	0.7700	101.3725 (80)

Solar gains	391.2164	695.1551	1018.8574	1361.7040	1605.5632	1626.5453	1554.8021	1369.7063	1138.0462	787.3928	474.0370	331.1590 (83)
Total gains	1095.2691	1416.7709	1709.9510	2029.0293	2238.3933	2236.4851	2141.0125	1956.3931	1742.6585	1412.4353	1137.5643	1019.8380 (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	63.2894	63.3415	63.3926	63.6339	63.6792	63.8912	63.8912	63.9306	63.8094	63.6792	63.5876	63.4920	
alpha	5.2193	5.2228	5.2262	5.2423	5.2453	5.2594	5.2594	5.2620	5.2540	5.2453	5.2392	5.2328	
util living area	0.9953	0.9828	0.9454	0.8349	0.6547	0.4676	0.3385	0.3863	0.6283	0.9106	0.9873	0.9967	(86)
Living	19.7935	20.0816	20.4326	20.7777	20.9466	20.9922	20.9988	20.9977	20.9674	20.6885	20.1565	19.7347	
Non living	18.5693	18.9340	19.3665	19.7626	19.9277	19.9657	19.9692	19.9694	19.9497	19.6795	19.0347	18.4965	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	14	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	17	28	15	0	0	0	0	0	0	0	0	31	
MIT	20.6253	20.4798	20.5516	20.7777	20.9466	20.9922	20.9988	20.9977	20.9674	20.6885	20.1565	20.2834	(87)
Th 2	19.9607	19.9615	19.9622	19.9657	19.9664	19.9695	19.9695	19.9700	19.9683	19.9664	19.9651	19.9637	(88)
util rest of house	0.9937	0.9773	0.9291	0.7946	0.5928	0.3945	0.2597	0.3007	0.5450	0.8766	0.9824	0.9956	(89)
MIT 2	19.6239	19.5080	19.5275	19.7626	19.9277	19.9657	19.9692	19.9694	19.9497	19.6795	19.0347	19.3161	(90)
Living area fraction									fLA = Living area / (4) =			0.1793	(91)
MIT	19.8035	19.6822	19.7112	19.9446	20.1103	20.1498	20.1538	20.1538	20.1322	19.8604	19.2358	19.4896	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8035	19.6822	19.7112	19.9446	20.1103	20.1498	20.1538	20.1538	20.1322	19.8604	19.2358	19.4896	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9934	0.9755	0.9244	0.7937	0.6018	0.4074	0.2738	0.3161	0.5587	0.8724	0.9775	0.9949	(94)
Useful gains	1088.0799	1382.0733	1580.6848	1610.4477	1346.9721	911.2387	586.2241	618.3288	973.7061	1232.2210	1111.9670	1014.6705	(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	2583.8012	2461.5738	2198.1799	1830.7220	1393.0837	916.2084	586.6946	619.3250	997.1238	1533.8902	2013.0656	2540.0162	(97)
Space heating kWh	1112.8167	725.4243	459.4163	158.5976	34.3070	0.0000	0.0000	0.0000	0.0000	224.4419	648.7910	1134.8572	(98a)
Space heating requirement - total per year (kWh/year)												4498.6520	
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	1112.8167	725.4243	459.4163	158.5976	34.3070	0.0000	0.0000	0.0000	0.0000	224.4419	648.7910	1134.8572	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4498.6520	
Space heating per m2											(98c) / (4) =	31.0252	(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 %)	306.3785 (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	1112.8167	725.4243	459.4163	158.5976	34.3070	0.0000	0.0000	0.0000	0.0000	224.4419	648.7910	1134.8572	(98)
Space heating efficiency (main heating system 1)	306.3785	306.3785	306.3785	306.3785	306.3785	0.0000	0.0000	0.0000	0.0000	306.3785	306.3785	306.3785	(210)
Space heating fuel (main heating system)	363.2163	236.7739	149.9506	51.7652	11.1976	0.0000	0.0000	0.0000	0.0000	73.2564	211.7613	370.4102	(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

290.1851	256.5841	272.3061	238.5602	230.7126	207.2884	204.0552	212.4358	215.0917	240.5861	256.7541	286.8872 (64)

Efficiency of water heater

											168.5784 (216)
(217)m	168.5784	168.5784	168.5784	168.5784	168.5784	168.5784	168.5784	168.5784	168.5784	168.5784	168.5784 (217)

Fuel for water heating, kWh/month

172.1366	152.2046	161.5308	141.5129	136.8577	122.9626	121.0447	126.0160	127.5915	142.7146	152.3054	170.1803 (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 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	43.2825	34.7228	31.2640	22.9054	17.6928	14.4551	16.1399	20.9793	27.2500	35.7535	40.3835	44.4854 (232)

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

(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

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

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	1468.3316 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	168.5784
Water heating fuel used	1727.0577 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	349.3142 (232)

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

PV generation	0.0000 (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	3544.7035 (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	1468.3316	0.1575	231.2267	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1727.0577	0.1410	243.4449	(264)
Space and water heating			474.6716	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	349.3142	0.1443	50.4168	(268)
Total CO2, kg/year			525.0885	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6200	(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	1468.3316	1.5829	2324.2673	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1727.0577	1.5212	2627.2338	(278)
Space and water heating			4951.5011	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	349.3142	1.5338	535.7898	(282)
Total Primary energy kWh/year			5487.2909	(286)
Dwelling Primary energy Rate (DPER)			37.8400	(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	80.0000 (1b)	x	2.4000 (2b)	=	192.0000 (1b)	-
First floor	65.0000 (1c)	x	2.4000 (2c)	=	156.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	348.0000	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1149	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(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)
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	
TER Opening Type (Uw = 1.20)			36.2600	1.1450	41.5191			(27)
Heatloss Floor 1			80.0000	0.1300	10.4000			(28a)
External Wall 1	192.0000	36.2600	155.7400	0.1800	28.0332			(29a)
External Roof 1	65.0000		65.0000	0.1100	7.1500			(30)
External Roof 2	16.0000		16.0000	0.1100	1.7600			(30)
Total net area of external elements Aum(A, m2)			353.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		88.8623			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 261.8759 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	45.0000	0.1600	7.2000
E6 Intermediate floor within a dwelling	35.0000	0.0000	0.0000
E16 Corner (normal)	19.2000	0.0900	1.7280
E2 Other lintels (including other steel lintels)	26.6000	0.0500	1.3300
E3 Sill	21.4000	0.0500	1.0700
E4 Jamb	55.5400	0.0500	2.7770
E10 Eaves (insulation at ceiling level)	23.0000	0.0600	1.3800
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0850 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 104.9473 (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	66.4019	66.0532	65.7113	64.1055	63.8051	62.4065	62.4065	62.1475	62.9452	63.8051	64.4129	65.0483	(38)
Heat transfer coeff	171.3492	171.0004	170.6586	169.0528	168.7524	167.3538	167.3538	167.0948	167.8925	168.7524	169.3601	169.9955	(39)

Average = Sum(39)m / 12 = 169.0514

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1817	1.1793	1.1770	1.1659	1.1638	1.1542	1.1542	1.1524	1.1579	1.1638	1.1680	1.1724	(40)
HLP (average)												1.1659	
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 2.9261 (42)

Hot water usage for mixer showers

	73.2803	72.1790	70.5742	67.5038	65.2380	62.7111	61.2748	62.8674	64.6132	67.3263	70.4626	72.9995 (42a)

Hot water usage for baths

	31.6361	31.1663	30.5047	29.2847	28.3712	27.3583	26.8112	27.4682	28.1836	29.2674	30.5125	31.5292 (42b)

Hot water usage for other uses

	44.5958	42.9741	41.3525	39.7308	38.1091	36.4875	36.4875	38.1091	39.7308	41.3525	42.9741	44.5958 (42c)

Average daily hot water use (litres/day) 137.4352 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	149.5122	146.3194	142.4313	136.5193	131.7183	126.5569	124.5735	128.4448	132.5276	137.9462	143.9493	149.1244	(44)
Energy conte	236.7907	208.3569	218.9117	186.8882	177.3182	155.6164	150.6608	159.0414	163.4197	187.1917	205.0821	233.4928	(45)
Energy content (annual)										Total = Sum(45)m =		2282.7706	
Distribution loss (46)m = 0.15 x (45)m													
	35.5186	31.2535	32.8368	28.0332	26.5977	23.3425	22.5991	23.8562	24.5130	28.0787	30.7623	35.0239	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	283.3856	250.4426	265.5066	231.9800	223.9131	200.7083	197.2557	205.6363	208.5116	233.7866	250.1739	280.0877	(62)
WWHRS	-33.5007	-29.6283	-31.0250	-25.6899	-23.9421	-20.4874	-19.2037	-20.4212	-21.1971	-24.9890	-28.3095	-32.8803	(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													
	249.8849	220.8143	234.4816	206.2901	199.9710	180.2209	178.0520	185.2151	187.3145	208.7975	221.8644	247.2074	(64)
										Total per year (kWh/year) = Sum(64)m =		2520.1138	(64)
12Total per year (kWh/year)												2520	(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													
	116.0088	102.9472	110.0641	98.2138	96.2342	87.8159	87.3706	90.1572	90.4105	99.5171	104.2633	114.9123	(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	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.8959	175.9204	158.8959	164.1924	158.8959	164.1924	158.8959	158.8959	164.1924	158.8959	164.1924	158.8959	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	315.0288	318.2978	310.0600	292.5227	270.3850	249.5787	235.6787	232.4097	240.6475	258.1849	280.3226	301.1289	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	(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)													
	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	(71)
Water heating gains (Table 5)													
	155.9259	153.1953	147.9356	136.4080	129.3471	121.9666	117.4337	121.1790	125.5702	133.7596	144.8101	154.4520	(72)
Total internal gains													
	699.7414	717.3044	686.7823	663.0140	628.5188	602.6285	578.8992	579.3755	597.3010	620.7312	659.2160	684.3677	(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	10.0700	10.6334	0.6300	0.7000	0.7700	32.7245	(74)
East	3.5600	19.6403	0.6300	0.7000	0.7700	21.3683	(76)
South	10.6300	46.7521	0.6300	0.7000	0.7700	151.8819	(78)
West	12.0000	19.6403	0.6300	0.7000	0.7700	72.0278	(80)

Solar gains	278.0025	493.9841	724.0077	967.6310	1140.9112	1155.8177	1104.8386	973.3150	808.7024	559.5286	336.8556	235.3251	(83)
Total gains	977.7439	1211.2886	1410.7900	1630.6450	1769.4300	1758.4462	1683.7378	1552.6905	1406.0034	1180.2598	996.0716	919.6927	(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	61.5572	61.6827	61.8063	62.3934	62.5045	63.0268	63.0268	63.1245	62.8246	62.5045	62.2802	62.0474	
alpha	5.1038	5.1122	5.1204	5.1596	5.1670	5.2018	5.2018	5.2083	5.1883	5.1670	5.1520	5.1365	
util living area													
	0.9973	0.9915	0.9750	0.9163	0.7838	0.5902	0.4340	0.4885	0.7479	0.9538	0.9931	0.9980	(86)
MIT	19.6633	19.8998	20.2206	20.6082	20.8702	20.9763	20.9960	20.9928	20.9239	20.5527	20.0305	19.6245	(87)
Th 2	19.9347	19.9366	19.9385	19.9474	19.9491	19.9568	19.9568	19.9583	19.9538	19.9491	19.9457	19.9422	(88)
util rest of house													
	0.9963	0.9886	0.9663	0.8888	0.7238	0.5022	0.3329	0.3813	0.6622	0.9325	0.9902	0.9973	(89)
MIT 2	18.3845	18.6870	19.0920	19.5660	19.8475	19.9446	19.9557	19.9560	19.9066	19.5139	18.8618	18.3403	(90)
Living area fraction											fLA = Living area / (4) =		0.1793 (91)
MIT	18.6138	18.9044	19.2944	19.7529	20.0309	20.1296	20.1422	20.1419	20.0890	19.7002	19.0714	18.5705	(92)
Temperature adjustment													0.0000
adjusted MIT	18.6138	18.9044	19.2944	19.7529	20.0309	20.1296	20.1422	20.1419	20.0890	19.7002	19.0714	18.5705	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9945	0.9846	0.9594	0.8828	0.7289	0.5172	0.3511	0.4006	0.6742	0.9260	0.9868	0.9959	(94)
Useful gains	972.3436	1192.6397	1353.4960	1439.4598	1289.7303	909.5553	591.1216	621.9728	947.9791	1092.9370	982.8879	915.8879	(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													
	2452.6583	2394.7630	2183.4754	1834.7075	1405.8600	925.3964	592.8075	625.2566	1005.5038	1535.6768	2027.4731	2442.9263	(97)
Space heating kWh													
	1101.3542	807.8268	617.5047	284.5783	86.4005	0.0000	0.0000	0.0000	0.0000	329.3984	752.1013	1136.1166	(98a)
Space heating requirement - total per year (kWh/year)												5115.2808	
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													
	1101.3542	807.8268	617.5047	284.5783	86.4005	0.0000	0.0000	0.0000	0.0000	329.3984	752.1013	1136.1166	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5115.2808	
Space heating per m2											(98c) / (4) =		35.2778 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1101.3542	807.8268	617.5047	284.5783	86.4005	0.0000	0.0000	0.0000	0.0000	329.3984	752.1013	1136.1166	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	1193.2331	875.2187	669.0192	308.3189	93.6083	0.0000	0.0000	0.0000	0.0000	356.8780	814.8443	1230.8955	(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													
	249.8849	220.8143	234.4816	206.2901	199.9710	180.2209	178.0520	185.2151	187.3145	208.7975	221.8644	247.2074	(64)
Efficiency of water heater													79.8000 (216)
(217)m	86.9858	86.7009	86.1267	84.7816	82.3171	79.8000	79.8000	79.8000	79.8000	85.0775	86.5758	87.0456	(217)
Fuel for water heating, kWh/month													
	287.2711	254.6851	272.2520	243.3194	242.9275	225.8407	223.1228	232.0992	234.7300	245.4205	256.2662	283.9976	(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	33.0154	26.4862	23.8479	17.4720	13.4959	11.0262	12.3114	16.0028	20.7860	27.2724	30.8041	33.9330	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-68.1025	-92.7650	-128.8526	-139.7826	-146.4792	-135.0989	-133.2577	-127.7255	-117.5556	-103.4306	-73.6330	-59.2519	(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	-49.0332	-101.7186	-199.6586	-296.3798	-388.6684	-389.4877	-385.0533	-327.6170	-242.1712	-144.4635	-65.1156	-38.8985	(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													5542.0160 (211)

Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3001.9320 (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)	266.4534 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3954.2004 (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	4942.2009 (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	5542.0160	0.2100	1163.8234	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3001.9320	0.2100	630.4057	(264)
Space and water heating			1794.2291	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	266.4534	0.1443	38.4575	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1325.9351	0.1354	-179.4754	
PV Unit electricity exported	-2628.2654	0.1262	-331.7829	
Total			-511.2584	(269)
Total CO2, kg/year			1333.3574	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2000	(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	5542.0160	1.1300	6262.4781	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3001.9320	1.1300	3392.1832	(278)
Space and water heating			9654.6612	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	266.4534	1.5338	408.6951	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1325.9351	1.5003	-1989.3026	
PV Unit electricity exported	-2628.2654	0.4634	-1217.9101	
Total			-3207.2127	(283)
Total Primary energy kWh/year			6986.2444	(286)
Target Primary Energy Rate (TPER)			48.1800	(287)

Full SAP Calculation Printout

Property Reference	House Type M	Issued on Date	05/10/2023
Assessment Reference	Plot 11	Prop Type Ref	
Property			

SAP Rating	82 B	DER	3.77	TER	9.64
Environmental	96 A	% DER < TER			60.89
CO_2 Emissions (t/year)	0.47	DFEE	38.33	TFEE	41.66
Compliance Check	See BREL	% DFEE < TFEE			7.98
% DPER < TPER	21.74	DPER	39.43	TPER	50.39

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	72.0000 (1b)	x	2.4000 (2b)	=	172.8000 (1b)	-
First floor	65.0000 (1c)	x	2.4000 (2c)	=	156.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	328.8000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0304	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2304	(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) =	0.1959	(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	0.2497	0.2448	0.2399	0.2154	0.2105	0.1861	0.1861	0.1812	0.1959	0.2105	0.2203	0.2301	(22b)
Effective ac	0.5312	0.5300	0.5288	0.5232	0.5222	0.5173	0.5173	0.5164	0.5192	0.5222	0.5243	0.5265	(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	
Opening Type 1 (Uw = 1.20)			40.0600	1.1450	45.8702			(27)
Heatloss Floor 1			72.0000	0.1200	8.6400	110.0000	7920.0000	(28a)
External Wall 1	180.0000	40.0600	139.9400	0.1900	26.5886	190.0000	26588.6000	(29a)
External Roof 1	65.0000		65.0000	0.1500	9.7500	9.0000	585.0000	(30)
External Roof 2	7.0000		7.0000	0.1500	1.0500	9.0000	63.0000	(30)
Total net area of external elements Aum(A, m2)			324.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	91.8988			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 35156.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 256.6175 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	40.0000	0.0670	2.6800
E6 Intermediate floor within a dwelling	35.0000	0.0020	0.0700
E16 Corner (normal)	19.2000	0.0410	0.7872
E2 Other lintels (including other steel lintels)	24.4000	0.0240	0.5856
E3 Sill	18.4000	0.0190	0.3496
E4 Jamb	63.6000	0.0140	0.8904
E10 Eaves (insulation at ceiling level)	23.0000	0.0460	1.0580
E12 Gable (insulation at ceiling level)	10.0000	0.0330	0.3300

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.7508 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 98.6496 (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	57.6349	57.5035	57.3748	56.7700	56.6568	56.1301	56.1301	56.0325	56.3330	56.6568	56.8858	57.1251	(38)
Heat transfer coeff	156.2845	156.1532	156.0244	155.4196	155.3065	154.7797	154.7797	154.6822	154.9826	155.3065	155.5354	155.7747	(39)

Average = Sum(39)m / 12 = 155.4191

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1408	1.1398	1.1389	1.1344	1.1336	1.1298	1.1298	1.1291	1.1313	1.1336	1.1353	1.1370	(40)
HLP (average)												1.1344	
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 2.9111 (42)

Hot water usage for mixer showers												
	73.0302	71.9327	70.3334	67.2735	65.0153	62.4970	61.0657	62.6528	64.3927	67.0965	70.2222	72.7503 (42a)
Hot water usage for baths												
	31.5286	31.0603	30.4009	29.1852	28.2748	27.2653	26.7201	27.3749	28.0878	29.1679	30.4088	31.4220 (42b)
Hot water usage for other uses												
	44.4430	42.8269	41.2108	39.5947	37.9786	36.3625	36.3625	37.9786	39.5947	41.2108	42.8269	44.4430 (42c)

Average daily hot water use (litres/day) 136.9661 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.0018	145.8199	141.9451	136.0533	131.2687	126.1249	124.1482	128.0063	132.0751	137.4753	143.4578	148.6154	(44)
Energy conte	235.9824	207.6456	218.1644	186.2502	176.7129	155.0852	150.1465	158.4985	162.8619	186.5526	204.3820	232.6957	(45)

Energy content (annual) Total = Sum(45)m = 2274.9779

Distribution loss (46)m = 0.15 x (45)m												
	35.3974	31.1468	32.7247	27.9375	26.5069	23.2628	22.5220	23.7748	24.4293	27.9829	30.6573	34.9044 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9720 (55)
Total storage loss												
	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (56)
If cylinder contains dedicated solar storage												
	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	289.3768	255.8728	271.5588	237.9222	230.1073	206.7572	203.5409	211.8929	214.5339	239.9470	256.0540	286.0901 (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												
	289.3768	255.8728	271.5588	237.9222	230.1073	206.7572	203.5409	211.8929	214.5339	239.9470	256.0540	286.0901 (64)

Total per year (kWh/year) = Sum(64)m = 2903.6539 (64)
12Total per year (kWh/year) 2904 (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												
	121.1797	107.6239	115.2552	103.2658	101.4726	92.9034	92.6392	95.4163	95.4892	104.7443	109.2946	120.0869 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	154.3290	170.8642	154.3290	159.4733	154.3290	159.4733	154.3290	154.3290	159.4733	154.3290	159.4733	154.3290	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	305.9745	309.1495	301.1485	284.1152	262.6138	242.4054	228.9050	225.7300	233.7310	250.7643	272.2657	292.4741	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	(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)													
	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	(71)

Water heating gains (Table 5)

	162.8759	160.1546	154.9129	143.4247	136.3878	129.0326	124.5151	128.2477	132.6238	140.7853	151.7981	161.4071 (72)

Total internal gains

	689.8465	706.8356	677.0575	653.6803	619.9977	597.5784	574.4163	574.9738	592.4953	612.5457	650.2042	674.8773 (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	5.6000	10.6334	0.7600	0.7000	0.7700	21.9535 (74)
East	16.9000	19.6403	0.7600	0.7000	0.7700	122.3711 (76)
South	1.7600	46.7521	0.7600	0.7000	0.7700	30.3360 (78)
West	15.8000	19.6403	0.7600	0.7000	0.7700	114.4061 (80)

Solar gains	289.0668	554.8234	897.3796	1298.5404	1592.2057	1632.5630	1553.0206	1331.7661	1038.9955	653.1383	358.2744	239.2287 (83)
Total gains	978.9133	1261.6590	1574.4371	1952.2208	2212.2035	2230.1414	2127.4368	1906.7399	1631.4908	1265.6840	1008.4787	914.1060 (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	62.4868	62.5394	62.5910	62.8345	62.8803	63.0943	63.0943	63.1341	63.0117	62.8803	62.7878	62.6913	
alpha	5.1658	5.1693	5.1727	5.1890	5.1920	5.2063	5.2063	5.2089	5.2008	5.1920	5.1859	5.1794	
util living area	0.9960	0.9857	0.9478	0.8223	0.6262	0.4405	0.3195	0.3718	0.6284	0.9217	0.9897	0.9972	(86)
Living	19.7449	20.0245	20.4086	20.7885	20.9546	20.9938	20.9991	20.9980	20.9660	20.6552	20.1056	19.6899	
Non living	18.5148	18.8697	19.3448	19.7799	19.9407	19.9735	19.9763	19.9765	19.9557	19.6500	18.9781	18.4467	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	10	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	21	28	2	0	0	0	0	0	0	0	0	31	
MIT	20.5185	20.4475	20.4252	20.7885	20.9546	20.9938	20.9991	20.9980	20.9660	20.6552	20.1056	20.2580	(87)
Th 2	19.9677	19.9685	19.9692	19.9728	19.9735	19.9766	19.9766	19.9772	19.9754	19.9735	19.9721	19.9707	(88)
util rest of house	0.9947	0.9811	0.9323	0.7813	0.5658	0.3718	0.2455	0.2899	0.5459	0.8910	0.9856	0.9962	(89)
MIT 2	19.5333	19.4835	19.3673	19.7799	19.9407	19.9735	19.9763	19.9765	19.9557	19.6500	18.9781	19.2981	(90)
Living area fraction									fLA = Living area / (4) =			0.1241	(91)
MIT	19.6555	19.6031	19.4985	19.9051	20.0665	20.1001	20.1032	20.1033	20.0811	19.7747	19.1180	19.4172	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6555	19.6031	19.4985	19.9051	20.0665	20.1001	20.1032	20.1033	20.0811	19.7747	19.1180	19.4172	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9942	0.9791	0.9236	0.7784	0.5715	0.3802	0.2547	0.3000	0.5548	0.8838	0.9808	0.9956	(94)
Useful gains	973.2494	1235.2682	1454.1914	1519.5308	1264.2273	847.8035	541.9018	572.0705	905.1529	1118.6320	989.1253	910.0582	(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	2399.8306	2295.9392	2028.0903	1710.4010	1299.3734	851.3099	542.2297	572.8338	926.9660	1424.8889	1869.2249	2370.4494	(97)
Space heating kWh	1061.3764	712.7709	426.9807	137.4266	26.1486	0.0000	0.0000	0.0000	0.0000	227.8552	633.6716	1086.5310	(98a)
Space heating requirement - total per year (kWh/year)												4312.7611	
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	1061.3764	712.7709	426.9807	137.4266	26.1486	0.0000	0.0000	0.0000	0.0000	227.8552	633.6716	1086.5310	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4312.7611	
Space heating per m2											(98c) / (4) =	31.4800	(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 %) 300.9991 (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	1061.3764	712.7709	426.9807	137.4266	26.1486	0.0000	0.0000	0.0000	0.0000	227.8552	633.6716	1086.5310	(98)
Space heating efficiency (main heating system 1)	300.9991	300.9991	300.9991	300.9991	300.9991	0.0000	0.0000	0.0000	0.0000	300.9991	300.9991	300.9991	(210)
Space heating fuel (main heating system)	352.6179	236.8017	141.8545	45.6568	8.6873	0.0000	0.0000	0.0000	0.0000	75.6996	210.5228	360.9749	(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												
	289.3768	255.8728	271.5588	237.9222	230.1073	206.7572	203.5409	211.8929	214.5339	239.9470	256.0540	286.0901 (64)
Efficiency of water heater												168.9051 (216)
(217)m	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051 (217)
Fuel for water heating, kWh/month												
	171.3250	151.4891	160.7759	140.8614	136.2346	122.4103	120.5061	125.4508	127.0144	142.0602	151.5963	169.3792 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	41.9363	33.6429	30.2917	22.1930	17.1425	14.0056	15.6380	20.3268	26.4025	34.6415	39.1275	43.1019 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1432.8155 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	168.9051
Water heating fuel used	1719.1034 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	338.4501 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	3490.3690 (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	1432.8155	0.1575	225.6674	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1719.1034	0.1410	242.3208	(264)
Space and water heating			467.9882	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	338.4501	0.1443	48.8488	(268)
Total CO2, kg/year			516.8370	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7700	(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	1432.8155	1.5830	2268.1702	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1719.1034	1.5212	2615.1228	(278)
Space and water heating			4883.2930	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	338.4501	1.5338	519.1261	(282)
Total Primary energy kWh/year			5402.4191	(286)
Dwelling Primary energy Rate (DPER)			39.4300	(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	72.0000 (1b)	x	2.4000 (2b)	=	172.8000 (1b)	-
First floor	65.0000 (1c)	x	2.4000 (2c)	=	156.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	328.8000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1217	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3717	(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) =	0.3159	(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	0.4028	0.3949	0.3870	0.3475	0.3396	0.3001	0.3001	0.2922	0.3159	0.3396	0.3554	0.3712	(22b)
Effective ac	0.5811	0.5780	0.5749	0.5604	0.5577	0.5450	0.5450	0.5427	0.5499	0.5577	0.5632	0.5689	(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 Opening Type (Uw = 1.20)			34.2500	1.1450	39.2176			(27)
Heatloss Floor 1			72.0000	0.1300	9.3600			(28a)
External Wall 1	180.0000	34.2500	145.7500	0.1800	26.2350			(29a)
External Roof 1	65.0000		65.0000	0.1100	7.1500			(30)
External Roof 2	7.0000		7.0000	0.1100	0.7700			(30)
Total net area of external elements Aum(A, m2)			324.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		82.7326			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 256.6175 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	40.0000	0.1600	6.4000
E6 Intermediate floor within a dwelling	35.0000	0.0000	0.0000
E16 Corner (normal)	19.2000	0.0900	1.7280
E2 Other lintels (including other steel lintels)	24.4000	0.0500	1.2200
E3 Sill	18.4000	0.0500	0.9200
E4 Jamb	63.6000	0.0500	3.1800
E10 Eaves (insulation at ceiling level)	23.0000	0.0600	1.3800
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.4280	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	98.1606	(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	63.0534	62.7117	62.3766	60.8032	60.5088	59.1383	59.1383	58.8845	59.6662	60.5088	61.1043	61.7269	(38)
Heat transfer coeff	161.2140	160.8722	160.5372	158.9637	158.6693	157.2989	157.2989	157.0451	157.8267	158.6693	159.2649	159.8875	(39)
Average = Sum(39)m / 12 =												158.9623	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1767	1.1742	1.1718	1.1603	1.1582	1.1482	1.1482	1.1463	1.1520	1.1582	1.1625	1.1671	(40)
HLP (average)												1.1603	
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 2.9111 (42)
Hot water usage for mixer showers
73.0302 71.9327 70.3334 67.2735 65.0153 62.4970 61.0657 62.6528 64.3927 67.0965 70.2222 72.7503 (42a)
Hot water usage for baths
31.5286 31.0603 30.4009 29.1852 28.2748 27.2653 26.7201 27.3749 28.0878 29.1679 30.4088 31.4220 (42b)
Hot water usage for other uses
44.4430 42.8269 41.2108 39.5947 37.9786 36.3625 36.3625 37.9786 39.5947 41.2108 42.8269 44.4430 (42c)
Average daily hot water use (litres/day) 136.9661 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	149.0018	145.8199	141.9451	136.0533	131.2687	126.1249	124.1482	128.0063	132.0751	137.4753	143.4578	148.6154	(44)
Energy conte	235.9824	207.6456	218.1644	186.2502	176.7129	155.0852	150.1465	158.4985	162.8619	186.5526	204.3820	232.6957	(45)
Energy content (annual)										Total = Sum(45)m =		2274.9779	
Distribution loss (46)m = 0.15 x (45)m													
	35.3974	31.1468	32.7247	27.9375	26.5069	23.2628	22.5220	23.7748	24.4293	27.9829	30.6573	34.9044	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	282.5773	249.7313	264.7593	231.3420	223.3078	200.1771	196.7414	205.0934	207.9537	233.1475	249.4738	279.2906	(62)
WWHRS	-33.3863	-29.5271	-30.9191	-25.6023	-23.8604	-20.4175	-19.1382	-20.3515	-21.1247	-24.9037	-28.2129	-32.7681	(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													
	249.1909	220.2042	233.8402	205.7398	199.4474	179.7596	177.6033	184.7419	186.8290	208.2438	221.2609	246.5226	(64)
									Total per year (kWh/year) = Sum(64)m =			2513.3834	(64)
12Total per year (kWh/year)												2513	(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													
	115.7401	102.7107	109.8156	98.0017	96.0330	87.6393	87.1996	89.9767	90.2250	99.3047	104.0305	114.6473	(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	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	154.3290	170.8642	154.3290	159.4733	154.3290	159.4733	154.3290	154.3290	159.4733	154.3290	159.4733	154.3290	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	305.9745	309.1495	301.1485	284.1152	262.6138	242.4054	228.9050	225.7300	233.7310	250.7643	272.2657	292.4741	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	(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)													
	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	(71)
Water heating gains (Table 5)													
	155.5646	152.8434	147.6016	136.1134	129.0766	121.7213	117.2038	120.9364	125.3126	133.4740	144.4868	154.0958	(72)
Total internal gains													
	685.5352	702.5243	672.7462	649.3691	615.6865	590.2671	567.1050	567.6625	585.1840	608.2344	645.8930	670.5660	(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	4.7900	10.6334	0.6300	0.7000	0.7700	15.5661	(74)
East	14.4500	19.6403	0.6300	0.7000	0.7700	86.7335	(76)
South	1.5000	46.7521	0.6300	0.7000	0.7700	21.4321	(78)
West	13.5100	19.6403	0.6300	0.7000	0.7700	81.0913	(80)

Solar gains	204.8230	393.1488	635.9249	920.2550	1128.4048	1157.0188	1100.6410	943.8150	736.2977	462.8263	253.8649	169.5069	(83)
Total gains	890.3582	1095.6731	1308.6711	1569.6241	1744.0913	1747.2859	1667.7460	1511.4775	1321.4817	1071.0607	899.7579	840.0729	(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	60.5762	60.7048	60.8315	61.4337	61.5476	62.0839	62.0839	62.1842	61.8762	61.5476	61.3175	61.0787	
alpha	5.0384	5.0470	5.0554	5.0956	5.1032	5.1389	5.1389	5.1456	5.1251	5.1032	5.0878	5.0719	
util living area	0.9975	0.9925	0.9754	0.9081	0.7593	0.5613	0.4123	0.4723	0.7466	0.9584	0.9939	0.9981	(86)
MIT	19.6238	19.8533	20.1974	20.6189	20.8842	20.9801	20.9966	20.9935	20.9216	20.5227	19.9909	19.5882	(87)
Th 2	19.9386	19.9407	19.9426	19.9519	19.9536	19.9617	19.9617	19.9632	19.9586	19.9536	19.9501	19.9464	(88)
util rest of house	0.9966	0.9899	0.9670	0.8792	0.6984	0.4767	0.3165	0.3688	0.6617	0.9390	0.9914	0.9974	(89)
MIT 2	18.3394	18.6333	19.0682	19.5820	19.8637	19.9514	19.9607	19.9611	19.9093	19.4838	18.8172	18.2995	(90)
Living area fraction										fLA = Living area / (4) =		0.1241	(91)
MIT	18.4988	18.7847	19.2084	19.7106	19.9903	20.0791	20.0893	20.0892	20.0349	19.6127	18.9628	18.4594	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4988	18.7847	19.2084	19.7106	19.9903	20.0791	20.0893	20.0892	20.0349	19.6127	18.9628	18.4594	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9947	0.9858	0.9592	0.8714	0.7007	0.4865	0.3284	0.3816	0.6685	0.9307	0.9878	0.9960	(94)
Useful gains	885.6713	1080.1324	1255.3275	1367.7147	1222.0970	850.1372	547.6370	576.7921	883.4748	996.8385	888.8226	836.7113	(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	2289.0478	2233.6673	2040.1641	1718.5008	1315.4234	861.8491	548.8565	579.3705	936.6821	1430.0389	1889.3290	2279.9030	(97)
Space heating kWh	1044.1121	775.1754	583.9184	252.5660	69.4348	0.0000	0.0000	0.0000	0.0000	322.3011	720.3646	1073.7346	(98a)
Space heating requirement - total per year (kWh/year)												4841.6072	
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	1044.1121	775.1754	583.9184	252.5660	69.4348	0.0000	0.0000	0.0000	0.0000	322.3011	720.3646	1073.7346	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4841.6072	
Space heating per m2											(98c) / (4) =	35.3402	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1044.1121	775.1754	583.9184	252.5660	69.4348	0.0000	0.0000	0.0000	0.0000	322.3011	720.3646	1073.7346	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	1131.2157	839.8434	632.6310	273.6360	75.2273	0.0000	0.0000	0.0000	0.0000	349.1887	780.4601	1163.3095	(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	249.1909	220.2042	233.8402	205.7398	199.4474	179.7596	177.6033	184.7419	186.8290	208.2438	221.2609	246.5226	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.9114	86.6383	86.0256	84.5208	81.9447	79.8000	79.8000	79.8000	79.8000	85.0356	86.5074	86.9685	(217)
Fuel for water heating, kWh/month	286.7185	254.1648	271.8261	243.4192	243.3927	225.2626	222.5605	231.5061	234.1215	244.8900	255.7710	283.4618	(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	32.0665	25.7249	23.1625	16.9698	13.1080	10.7093	11.9575	15.5429	20.1886	26.4886	29.9188	32.9577	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-62.6048	-85.9383	-120.2897	-131.5376	-138.7083	-128.2528	-126.5228	-120.8547	-110.5579	-96.3364	-67.9345	-54.3895	(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	-42.8174	-89.0969	-175.3704	-261.0085	-342.9245	-343.8751	-339.9571	-288.9535	-213.1962	-126.7683	-56.9391	-33.9458	(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												5245.5116	(211)

Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2997.0948 (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)	258.7951 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3558.7804 (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	5028.6211 (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	5245.5116	0.2100	1101.5574	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2997.0948	0.2100	629.3899	(264)
Space and water heating			1730.9473	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	258.7951	0.1443	37.3521	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1243.9274	0.1352	-168.1619	
PV Unit electricity exported	-2314.8530	0.1262	-292.0372	
Total			-460.1991	(269)
Total CO2, kg/year			1320.0296	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6400	(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	5245.5116	1.1300	5927.4281	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2997.0948	1.1300	3386.7171	(278)
Space and water heating			9314.1452	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	258.7951	1.5338	396.9486	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1243.9274	1.4997	-1865.4670	
PV Unit electricity exported	-2314.8530	0.4631	-1072.0031	
Total			-2937.4701	(283)
Total Primary energy kWh/year			6903.7245	(286)
Target Primary Energy Rate (TPER)			50.3900	(287)

Full SAP Calculation Printout

Property Reference	House Type M	Issued on Date	05/10/2023
Assessment Reference	Plot 12	Prop Type Ref	
Property			

SAP Rating	82 B	DER	3.77	TER	9.64
Environmental	96 A	% DER < TER			60.89
CO_2 Emissions (t/year)	0.47	DFEE	38.33	TFEE	41.66
Compliance Check	See BREL	% DFEE < TFEE			7.98
% DPER < TPER	21.74	DPER	39.43	TPER	50.39

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	72.0000 (1b)	x	2.4000 (2b)	=	172.8000 (1b)	-
First floor	65.0000 (1c)	x	2.4000 (2c)	=	156.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	328.8000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0304	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2304	(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) =	0.1959	(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	0.2497	0.2448	0.2399	0.2154	0.2105	0.1861	0.1861	0.1812	0.1959	0.2105	0.2203	0.2301	(22b)
Effective ac	0.5312	0.5300	0.5288	0.5232	0.5222	0.5173	0.5173	0.5164	0.5192	0.5222	0.5243	0.5265	(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	
Opening Type 1 (Uw = 1.20)			40.0600	1.1450	45.8702			(27)
Heatloss Floor 1			72.0000	0.1200	8.6400	110.0000	7920.0000	(28a)
External Wall 1	180.0000	40.0600	139.9400	0.1900	26.5886	190.0000	26588.6000	(29a)
External Roof 1	65.0000		65.0000	0.1500	9.7500	9.0000	585.0000	(30)
External Roof 2	7.0000		7.0000	0.1500	1.0500	9.0000	63.0000	(30)
Total net area of external elements Aum(A, m2)			324.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	91.8988			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 35156.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 256.6175 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	40.0000	0.0670	2.6800
E6 Intermediate floor within a dwelling	35.0000	0.0020	0.0700
E16 Corner (normal)	19.2000	0.0410	0.7872
E2 Other lintels (including other steel lintels)	24.4000	0.0240	0.5856
E3 Sill	18.4000	0.0190	0.3496
E4 Jamb	63.6000	0.0140	0.8904
E10 Eaves (insulation at ceiling level)	23.0000	0.0460	1.0580
E12 Gable (insulation at ceiling level)	10.0000	0.0330	0.3300

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.7508 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 98.6496 (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	57.6349	57.5035	57.3748	56.7700	56.6568	56.1301	56.1301	56.0325	56.3330	56.6568	56.8858	57.1251	(38)
Heat transfer coeff	156.2845	156.1532	156.0244	155.4196	155.3065	154.7797	154.7797	154.6822	154.9826	155.3065	155.5354	155.7747	(39)

Average = Sum(39)m / 12 = 155.4191

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1408	1.1398	1.1389	1.1344	1.1336	1.1298	1.1298	1.1291	1.1313	1.1336	1.1353	1.1370	(40)
HLP (average)												1.1344	
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 2.9111 (42)

Hot water usage for mixer showers												
	73.0302	71.9327	70.3334	67.2735	65.0153	62.4970	61.0657	62.6528	64.3927	67.0965	70.2222	72.7503 (42a)
Hot water usage for baths												
	31.5286	31.0603	30.4009	29.1852	28.2748	27.2653	26.7201	27.3749	28.0878	29.1679	30.4088	31.4220 (42b)
Hot water usage for other uses												
	44.4430	42.8269	41.2108	39.5947	37.9786	36.3625	36.3625	37.9786	39.5947	41.2108	42.8269	44.4430 (42c)

Average daily hot water use (litres/day) 136.9661 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.0018	145.8199	141.9451	136.0533	131.2687	126.1249	124.1482	128.0063	132.0751	137.4753	143.4578	148.6154	(44)
Energy conte	235.9824	207.6456	218.1644	186.2502	176.7129	155.0852	150.1465	158.4985	162.8619	186.5526	204.3820	232.6957	(45)

Energy content (annual) Total = Sum(45)m = 2274.9779

Distribution loss (46)m = 0.15 x (45)m												
	35.3974	31.1468	32.7247	27.9375	26.5069	23.2628	22.5220	23.7748	24.4293	27.9829	30.6573	34.9044 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9720 (55)
Total storage loss												
	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (56)
If cylinder contains dedicated solar storage												
	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	289.3768	255.8728	271.5588	237.9222	230.1073	206.7572	203.5409	211.8929	214.5339	239.9470	256.0540	286.0901 (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												
	289.3768	255.8728	271.5588	237.9222	230.1073	206.7572	203.5409	211.8929	214.5339	239.9470	256.0540	286.0901 (64)

Total per year (kWh/year) = Sum(64)m = 2903.6539 (64)
12Total per year (kWh/year) 2904 (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												
	121.1797	107.6239	115.2552	103.2658	101.4726	92.9034	92.6392	95.4163	95.4892	104.7443	109.2946	120.0869 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	154.3290	170.8642	154.3290	159.4733	154.3290	159.4733	154.3290	154.3290	159.4733	154.3290	159.4733	154.3290	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	305.9745	309.1495	301.1485	284.1152	262.6138	242.4054	228.9050	225.7300	233.7310	250.7643	272.2657	292.4741	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	(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)													
	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	(71)

Water heating gains (Table 5)

	162.8759	160.1546	154.9129	143.4247	136.3878	129.0326	124.5151	128.2477	132.6238	140.7853	151.7981	161.4071 (72)

Total internal gains

	689.8465	706.8356	677.0575	653.6803	619.9977	597.5784	574.4163	574.9738	592.4953	612.5457	650.2042	674.8773 (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	5.6000	10.6334	0.7600	0.7000	0.7700	21.9535 (74)
East	16.9000	19.6403	0.7600	0.7000	0.7700	122.3711 (76)
South	1.7600	46.7521	0.7600	0.7000	0.7700	30.3360 (78)
West	15.8000	19.6403	0.7600	0.7000	0.7700	114.4061 (80)

Solar gains	289.0668	554.8234	897.3796	1298.5404	1592.2057	1632.5630	1553.0206	1331.7661	1038.9955	653.1383	358.2744	239.2287 (83)
Total gains	978.9133	1261.6590	1574.4371	1952.2208	2212.2035	2230.1414	2127.4368	1906.7399	1631.4908	1265.6840	1008.4787	914.1060 (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	62.4868	62.5394	62.5910	62.8345	62.8803	63.0943	63.0943	63.1341	63.0117	62.8803	62.7878	62.6913	
alpha	5.1658	5.1693	5.1727	5.1890	5.1920	5.2063	5.2063	5.2089	5.2008	5.1920	5.1859	5.1794	
util living area	0.9960	0.9857	0.9478	0.8223	0.6262	0.4405	0.3195	0.3718	0.6284	0.9217	0.9897	0.9972	(86)
Living	19.7449	20.0245	20.4086	20.7885	20.9546	20.9938	20.9991	20.9980	20.9660	20.6552	20.1056	19.6899	
Non living	18.5148	18.8697	19.3448	19.7799	19.9407	19.9735	19.9763	19.9765	19.9557	19.6500	18.9781	18.4467	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	10	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	21	28	2	0	0	0	0	0	0	0	0	31	
MIT	20.5185	20.4475	20.4252	20.7885	20.9546	20.9938	20.9991	20.9980	20.9660	20.6552	20.1056	20.2580	(87)
Th 2	19.9677	19.9685	19.9692	19.9728	19.9735	19.9766	19.9766	19.9772	19.9754	19.9735	19.9721	19.9707	(88)
util rest of house	0.9947	0.9811	0.9323	0.7813	0.5658	0.3718	0.2455	0.2899	0.5459	0.8910	0.9856	0.9962	(89)
MIT 2	19.5333	19.4835	19.3673	19.7799	19.9407	19.9735	19.9763	19.9765	19.9557	19.6500	18.9781	19.2981	(90)
Living area fraction									fLA = Living area / (4) =			0.1241	(91)
MIT	19.6555	19.6031	19.4985	19.9051	20.0665	20.1001	20.1032	20.1033	20.0811	19.7747	19.1180	19.4172	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6555	19.6031	19.4985	19.9051	20.0665	20.1001	20.1032	20.1033	20.0811	19.7747	19.1180	19.4172	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9942	0.9791	0.9236	0.7784	0.5715	0.3802	0.2547	0.3000	0.5548	0.8838	0.9808	0.9956	(94)
Useful gains	973.2494	1235.2682	1454.1914	1519.5308	1264.2273	847.8035	541.9018	572.0705	905.1529	1118.6320	989.1253	910.0582	(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	2399.8306	2295.9392	2028.0903	1710.4010	1299.3734	851.3099	542.2297	572.8338	926.9660	1424.8889	1869.2249	2370.4494	(97)
Space heating kWh	1061.3764	712.7709	426.9807	137.4266	26.1486	0.0000	0.0000	0.0000	0.0000	227.8552	633.6716	1086.5310	(98a)
Space heating requirement - total per year (kWh/year)												4312.7611	
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	1061.3764	712.7709	426.9807	137.4266	26.1486	0.0000	0.0000	0.0000	0.0000	227.8552	633.6716	1086.5310	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4312.7611	
Space heating per m2											(98c) / (4) =	31.4800	(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 %) 300.9991 (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	1061.3764	712.7709	426.9807	137.4266	26.1486	0.0000	0.0000	0.0000	0.0000	227.8552	633.6716	1086.5310	(98)
Space heating efficiency (main heating system 1)	300.9991	300.9991	300.9991	300.9991	300.9991	0.0000	0.0000	0.0000	0.0000	300.9991	300.9991	300.9991	(210)
Space heating fuel (main heating system)	352.6179	236.8017	141.8545	45.6568	8.6873	0.0000	0.0000	0.0000	0.0000	75.6996	210.5228	360.9749	(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												
	289.3768	255.8728	271.5588	237.9222	230.1073	206.7572	203.5409	211.8929	214.5339	239.9470	256.0540	286.0901 (64)
Efficiency of water heater												168.9051 (216)
(217)m	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051 (217)
Fuel for water heating, kWh/month												
	171.3250	151.4891	160.7759	140.8614	136.2346	122.4103	120.5061	125.4508	127.0144	142.0602	151.5963	169.3792 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	41.9363	33.6429	30.2917	22.1930	17.1425	14.0056	15.6380	20.3268	26.4025	34.6415	39.1275	43.1019 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1432.8155 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	168.9051
Water heating fuel used	1719.1034 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	338.4501 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	3490.3690 (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	1432.8155	0.1575	225.6674	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1719.1034	0.1410	242.3208	(264)
Space and water heating			467.9882	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	338.4501	0.1443	48.8488	(268)
Total CO2, kg/year			516.8370	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7700	(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	1432.8155	1.5830	2268.1702	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1719.1034	1.5212	2615.1228	(278)
Space and water heating			4883.2930	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	338.4501	1.5338	519.1261	(282)
Total Primary energy kWh/year			5402.4191	(286)
Dwelling Primary energy Rate (DPER)			39.4300	(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	72.0000 (1b)	x	2.4000 (2b)	=	172.8000 (1b)	-
First floor	65.0000 (1c)	x	2.4000 (2c)	=	156.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	328.8000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1217	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3717	(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) =	0.3159	(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	0.4028	0.3949	0.3870	0.3475	0.3396	0.3001	0.3001	0.2922	0.3159	0.3396	0.3554	0.3712	(22b)
Effective ac	0.5811	0.5780	0.5749	0.5604	0.5577	0.5450	0.5450	0.5427	0.5499	0.5577	0.5632	0.5689	(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 Opening Type (Uw = 1.20)			34.2500	1.1450	39.2176			(27)
Heatloss Floor 1			72.0000	0.1300	9.3600			(28a)
External Wall 1	180.0000	34.2500	145.7500	0.1800	26.2350			(29a)
External Roof 1	65.0000		65.0000	0.1100	7.1500			(30)
External Roof 2	7.0000		7.0000	0.1100	0.7700			(30)
Total net area of external elements Aum(A, m2)			324.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		82.7326			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 256.6175 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	40.0000	0.1600	6.4000
E6 Intermediate floor within a dwelling	35.0000	0.0000	0.0000
E16 Corner (normal)	19.2000	0.0900	1.7280
E2 Other lintels (including other steel lintels)	24.4000	0.0500	1.2200
E3 Sill	18.4000	0.0500	0.9200
E4 Jamb	63.6000	0.0500	3.1800
E10 Eaves (insulation at ceiling level)	23.0000	0.0600	1.3800
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.4280	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	98.1606	(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	63.0534	62.7117	62.3766	60.8032	60.5088	59.1383	59.1383	58.8845	59.6662	60.5088	61.1043	61.7269	(38)
Heat transfer coeff	161.2140	160.8722	160.5372	158.9637	158.6693	157.2989	157.2989	157.0451	157.8267	158.6693	159.2649	159.8875	(39)
Average = Sum(39)m / 12 =												158.9623	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1767	1.1742	1.1718	1.1603	1.1582	1.1482	1.1482	1.1463	1.1520	1.1582	1.1625	1.1671	(40)
HLP (average)												1.1603	
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 2.9111 (42)
Hot water usage for mixer showers
73.0302 71.9327 70.3334 67.2735 65.0153 62.4970 61.0657 62.6528 64.3927 67.0965 70.2222 72.7503 (42a)
Hot water usage for baths
31.5286 31.0603 30.4009 29.1852 28.2748 27.2653 26.7201 27.3749 28.0878 29.1679 30.4088 31.4220 (42b)
Hot water usage for other uses
44.4430 42.8269 41.2108 39.5947 37.9786 36.3625 36.3625 37.9786 39.5947 41.2108 42.8269 44.4430 (42c)
Average daily hot water use (litres/day) 136.9661 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	149.0018	145.8199	141.9451	136.0533	131.2687	126.1249	124.1482	128.0063	132.0751	137.4753	143.4578	148.6154	(44)
Energy conte	235.9824	207.6456	218.1644	186.2502	176.7129	155.0852	150.1465	158.4985	162.8619	186.5526	204.3820	232.6957	(45)
Energy content (annual)										Total = Sum(45)m =		2274.9779	
Distribution loss (46)m = 0.15 x (45)m													
	35.3974	31.1468	32.7247	27.9375	26.5069	23.2628	22.5220	23.7748	24.4293	27.9829	30.6573	34.9044	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	282.5773	249.7313	264.7593	231.3420	223.3078	200.1771	196.7414	205.0934	207.9537	233.1475	249.4738	279.2906	(62)
WWHRS	-33.3863	-29.5271	-30.9191	-25.6023	-23.8604	-20.4175	-19.1382	-20.3515	-21.1247	-24.9037	-28.2129	-32.7681	(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													
	249.1909	220.2042	233.8402	205.7398	199.4474	179.7596	177.6033	184.7419	186.8290	208.2438	221.2609	246.5226	(64)
									Total per year (kWh/year) = Sum(64)m =			2513.3834	(64)
12Total per year (kWh/year)												2513	(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													
	115.7401	102.7107	109.8156	98.0017	96.0330	87.6393	87.1996	89.9767	90.2250	99.3047	104.0305	114.6473	(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	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	154.3290	170.8642	154.3290	159.4733	154.3290	159.4733	154.3290	154.3290	159.4733	154.3290	159.4733	154.3290	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	305.9745	309.1495	301.1485	284.1152	262.6138	242.4054	228.9050	225.7300	233.7310	250.7643	272.2657	292.4741	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	(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)													
	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	(71)
Water heating gains (Table 5)													
	155.5646	152.8434	147.6016	136.1134	129.0766	121.7213	117.2038	120.9364	125.3126	133.4740	144.4868	154.0958	(72)
Total internal gains													
	685.5352	702.5243	672.7462	649.3691	615.6865	590.2671	567.1050	567.6625	585.1840	608.2344	645.8930	670.5660	(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	4.7900	10.6334	0.6300	0.7000	0.7700	15.5661	(74)
East	14.4500	19.6403	0.6300	0.7000	0.7700	86.7335	(76)
South	1.5000	46.7521	0.6300	0.7000	0.7700	21.4321	(78)
West	13.5100	19.6403	0.6300	0.7000	0.7700	81.0913	(80)

Solar gains	204.8230	393.1488	635.9249	920.2550	1128.4048	1157.0188	1100.6410	943.8150	736.2977	462.8263	253.8649	169.5069	(83)
Total gains	890.3582	1095.6731	1308.6711	1569.6241	1744.0913	1747.2859	1667.7460	1511.4775	1321.4817	1071.0607	899.7579	840.0729	(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	60.5762	60.7048	60.8315	61.4337	61.5476	62.0839	62.0839	62.1842	61.8762	61.5476	61.3175	61.0787	
alpha	5.0384	5.0470	5.0554	5.0956	5.1032	5.1389	5.1389	5.1456	5.1251	5.1032	5.0878	5.0719	
util living area	0.9975	0.9925	0.9754	0.9081	0.7593	0.5613	0.4123	0.4723	0.7466	0.9584	0.9939	0.9981	(86)
MIT	19.6238	19.8533	20.1974	20.6189	20.8842	20.9801	20.9966	20.9935	20.9216	20.5227	19.9909	19.5882	(87)
Th 2	19.9386	19.9407	19.9426	19.9519	19.9536	19.9617	19.9617	19.9632	19.9586	19.9536	19.9501	19.9464	(88)
util rest of house	0.9966	0.9899	0.9670	0.8792	0.6984	0.4767	0.3165	0.3688	0.6617	0.9390	0.9914	0.9974	(89)
MIT 2	18.3394	18.6333	19.0682	19.5820	19.8637	19.9514	19.9607	19.9611	19.9093	19.4838	18.8172	18.2995	(90)
Living area fraction										fLA = Living area / (4) =		0.1241	(91)
MIT	18.4988	18.7847	19.2084	19.7106	19.9903	20.0791	20.0893	20.0892	20.0349	19.6127	18.9628	18.4594	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4988	18.7847	19.2084	19.7106	19.9903	20.0791	20.0893	20.0892	20.0349	19.6127	18.9628	18.4594	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9947	0.9858	0.9592	0.8714	0.7007	0.4865	0.3284	0.3816	0.6685	0.9307	0.9878	0.9960	(94)
Useful gains	885.6713	1080.1324	1255.3275	1367.7147	1222.0970	850.1372	547.6370	576.7921	883.4748	996.8385	888.8226	836.7113	(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	2289.0478	2233.6673	2040.1641	1718.5008	1315.4234	861.8491	548.8565	579.3705	936.6821	1430.0389	1889.3290	2279.9030	(97)
Space heating kWh	1044.1121	775.1754	583.9184	252.5660	69.4348	0.0000	0.0000	0.0000	0.0000	322.3011	720.3646	1073.7346	(98a)
Space heating requirement - total per year (kWh/year)												4841.6072	
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	1044.1121	775.1754	583.9184	252.5660	69.4348	0.0000	0.0000	0.0000	0.0000	322.3011	720.3646	1073.7346	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4841.6072	
Space heating per m2											(98c) / (4) =	35.3402	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1044.1121	775.1754	583.9184	252.5660	69.4348	0.0000	0.0000	0.0000	0.0000	322.3011	720.3646	1073.7346	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	1131.2157	839.8434	632.6310	273.6360	75.2273	0.0000	0.0000	0.0000	0.0000	349.1887	780.4601	1163.3095	(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	249.1909	220.2042	233.8402	205.7398	199.4474	179.7596	177.6033	184.7419	186.8290	208.2438	221.2609	246.5226	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.9114	86.6383	86.0256	84.5208	81.9447	79.8000	79.8000	79.8000	79.8000	85.0356	86.5074	86.9685	(217)
Fuel for water heating, kWh/month	286.7185	254.1648	271.8261	243.4192	243.3927	225.2626	222.5605	231.5061	234.1215	244.8900	255.7710	283.4618	(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	32.0665	25.7249	23.1625	16.9698	13.1080	10.7093	11.9575	15.5429	20.1886	26.4886	29.9188	32.9577	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-62.6048	-85.9383	-120.2897	-131.5376	-138.7083	-128.2528	-126.5228	-120.8547	-110.5579	-96.3364	-67.9345	-54.3895	(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	-42.8174	-89.0969	-175.3704	-261.0085	-342.9245	-343.8751	-339.9571	-288.9535	-213.1962	-126.7683	-56.9391	-33.9458	(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												5245.5116	(211)

Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2997.0948 (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)	258.7951 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3558.7804 (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	5028.6211 (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	5245.5116	0.2100	1101.5574	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2997.0948	0.2100	629.3899	(264)
Space and water heating			1730.9473	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	258.7951	0.1443	37.3521	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1243.9274	0.1352	-168.1619	
PV Unit electricity exported	-2314.8530	0.1262	-292.0372	
Total			-460.1991	(269)
Total CO2, kg/year			1320.0296	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6400	(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	5245.5116	1.1300	5927.4281	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2997.0948	1.1300	3386.7171	(278)
Space and water heating			9314.1452	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	258.7951	1.5338	396.9486	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1243.9274	1.4997	-1865.4670	
PV Unit electricity exported	-2314.8530	0.4631	-1072.0031	
Total			-2937.4701	(283)
Total Primary energy kWh/year			6903.7245	(286)
Target Primary Energy Rate (TPER)			50.3900	(287)

Full SAP Calculation Printout

Property Reference	House Type P	Issued on Date	05/10/2023
Assessment Reference	Plot 13	Prop Type Ref	
Property			

SAP Rating	83 B	DER	3.43	TER	9.63
Environmental	96 A	% DER < TER			64.38
CO_2 Emissions (t/year)	0.57	DFEE	39.86	TFEE	43.17
Compliance Check	See BREL	% DFEE < TFEE			7.67
% DPER < TPER	29.31	DPER	35.70	TPER	50.50

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	80.0000 (1b)	x	2.4000 (2b)	=	192.0000 (1b)	-
First floor	64.0000 (1c)	x	2.4000 (2c)	=	153.6000 (1c)	-
Second floor	40.0000 (1d)	x	2.4000 (2d)	=	96.0000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	184.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	441.6000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0226	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2226	(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) =	0.1892	(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	0.2413	0.2366	0.2318	0.2082	0.2034	0.1798	0.1798	0.1751	0.1892	0.2034	0.2129	0.2224	(22b)
Effective ac	0.5291	0.5280	0.5269	0.5217	0.5207	0.5162	0.5162	0.5153	0.5179	0.5207	0.5227	0.5247	(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	
Opening Type 1 (Uw = 1.20)			56.3300	1.1450	64.5000			(27)
Heatloss Floor 1			80.0000	0.1200	9.6000	110.0000	8800.0000	(28a)
External Wall 1	274.0000	56.3300	217.6700	0.1900	41.3573	190.0000	41357.3000	(29a)
External Roof 1	64.0000		64.0000	0.1500	9.6000	9.0000	576.0000	(30)
External Roof 2	16.0000		16.0000	0.1500	2.4000	9.0000	144.0000	(30)
Total net area of external elements Aum(A, m2)			434.0000					(31)

Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 127.4573 (33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 50877.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.5071 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E5 Ground floor (normal)	46.0000	0.0670	3.0820
	E6 Intermediate floor within a dwelling	66.0000	0.0020	0.1320
	E16 Corner (normal)	28.8000	0.0410	1.1808
	E2 Other lintels (including other steel lintels)	25.0000	0.0240	0.6000
	E3 Sill	20.0000	0.0190	0.3800
	E4 Jamb	60.0000	0.0140	0.8400
	E10 Eaves (insulation at ceiling level)	20.0000	0.0460	0.9200
	E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5308 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 134.9881 (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	77.1063	76.9415	76.7801	76.0216	75.8797	75.2192	75.2192	75.0969	75.4736	75.8797	76.1668	76.4669	(38)
Heat transfer coeff	212.0944	211.9296	211.7682	211.0097	210.8678	210.2073	210.2073	210.0850	210.4617	210.8678	211.1549	211.4550	(39)

Average = Sum(39)m / 12 = 211.0091

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1527	1.1518	1.1509	1.1468	1.1460	1.1424	1.1424	1.1418	1.1438	1.1460	1.1476	1.1492	(40)
HLP (average)												1.1468	
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 2.9811 (42)
Hot water usage for mixer showers

74.2024	73.0873	71.4623	68.3533	66.0589	63.5002	62.0459	63.6585	65.4263	68.1735	71.3493	73.9181	(42a)

Hot water usage for baths

32.0327	31.5569	30.8870	29.6518	28.7269	27.7013	27.1473	27.8125	28.5369	29.6343	30.8950	31.9244	(42b)

Hot water usage for other uses

45.1590	43.5169	41.8747	40.2326	38.5904	36.9483	36.9483	38.5904	40.2326	41.8747	43.5169	45.1590	(42c)

Average daily hot water use (litres/day) 139.1651 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.3941	148.1611	144.2241	138.2377	133.3762	128.1498	126.1414	130.0615	134.1957	139.6825	145.7612	151.0015	(44)
Energy conte	239.7712	210.9794	221.6670	189.2404	179.5500	157.5751	152.5571	161.0433	165.4767	189.5479	207.6635	236.4318	(45)

Energy content (annual) Total = Sum(45)m = 2311.5035
Distribution loss (46)m = 0.15 x (45)m

35.9657	31.6469	33.2501	28.3861	26.9325	23.6363	22.8836	24.1565	24.8215	28.4322	31.1495	35.4648	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

293.1656	259.2066	275.0614	240.9124	232.9444	209.2471	205.9515	214.4377	217.1487	242.9423	259.3355	289.8262	(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

293.1656	259.2066	275.0614	240.9124	232.9444	209.2471	205.9515	214.4377	217.1487	242.9423	259.3355	289.8262	(64)

Total per year (kWh/year) = Sum(64)m = 2940.1795 (64)
12Total per year (kWh/year) 2940 (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

122.4394	108.7324	116.4198	104.2600	102.4159	93.7313	93.4408	96.2624	96.3586	105.7402	110.3857	121.3291	(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	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	179.3457	198.5614	179.3457	185.3239	179.3457	185.3239	179.3457	179.3457	185.3239	179.3457	185.3239	179.3457	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	355.5730	359.2627	349.9647	330.1704	305.1835	281.6994	266.0106	262.3209	271.6189	291.4132	316.4001	339.8842	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	(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)													

	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	(71)
Water heating gains (Table 5)												
	164.5692	161.8042	156.4782	144.8056	137.6558	130.1824	125.5924	129.3850	133.8314	142.1239	153.3135	163.0768 (72)
Total internal gains												
	767.2038	787.3442	753.5046	728.0158	689.9009	664.9216	638.6646	638.7674	658.4901	680.5988	722.7534	750.0225 (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	21.8600	10.6334	0.7600	0.7000	0.7700	85.6972	(74)
East	4.7500	19.6403	0.7600	0.7000	0.7700	34.3942	(76)
South	10.6500	46.7521	0.7600	0.7000	0.7700	183.5673	(78)
West	19.0700	19.6403	0.7600	0.7000	0.7700	138.0838	(80)

Solar gains	441.7426	801.8115	1216.9011	1690.2178	2046.3475	2095.3583	1993.8572	1720.7696	1380.8872	919.5710	538.3683	371.8981 (83)
Total gains	1208.9464	1589.1556	1970.4056	2418.2336	2736.2484	2760.2799	2632.5218	2359.5370	2039.3773	1600.1697	1261.1217	1121.9206 (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	66.6335	66.6853	66.7361	66.9760	67.0210	67.2317	67.2317	67.2708	67.1504	67.0210	66.9299	66.8349	
alpha	5.4422	5.4457	5.4491	5.4651	5.4681	5.4821	5.4821	5.4847	5.4767	5.4681	5.4620	5.4557	
util living area													
	0.9981	0.9916	0.9661	0.8673	0.6795	0.4825	0.3506	0.4078	0.6762	0.9445	0.9943	0.9987	(86)
Living	19.7452	20.0132	20.3728	20.7548	20.9453	20.9927	20.9990	20.9977	20.9606	20.6334	20.0960	19.6926	
Non living	18.4997	18.8414	19.2908	19.7370	19.9243	19.9629	19.9661	19.9662	19.9428	19.6158	18.9512	18.4344	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	0	0	0	0	0	0	0	0	0	0	16	
16 / 9	0	28	31	0	0	0	0	0	0	0	22	15	
MIT	21.0000	20.4411	20.6448	20.7548	20.9453	20.9927	20.9990	20.9977	20.9606	20.6334	20.3835	20.6417	(87)
Th 2	19.9580	19.9588	19.9595	19.9628	19.9634	19.9663	19.9663	19.9669	19.9652	19.9634	19.9622	19.9608	(88)
util rest of house													
	0.9974	0.9886	0.9545	0.8300	0.6161	0.4069	0.2687	0.3172	0.5894	0.9192	0.9918	0.9983	(89)
MIT 2	19.9580	19.4656	19.6643	19.7370	19.9243	19.9629	19.9661	19.9662	19.9428	19.6158	19.3653	19.6348	(90)
Living area fraction											fLA = Living area / (4) =	0.1576	(91)
MIT	20.1223	19.6194	19.8189	19.8974	20.0852	20.1252	20.1289	20.1288	20.1032	19.7762	19.5258	19.7935	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1223	19.6194	19.8189	19.8974	20.0852	20.1252	20.1289	20.1288	20.1032	19.7762	19.5258	19.7935	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9975	0.9874	0.9526	0.8274	0.6239	0.4186	0.2816	0.3315	0.6016	0.9134	0.9904	0.9982	(94)
Useful gains	1205.9542	1569.0922	1877.0508	2000.7913	1707.0841	1155.5737	741.2775	782.1239	1226.8873	1461.6604	1249.0376	1119.8533	(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													
	3355.8120	3119.4672	2820.5121	2320.5641	1768.1688	1161.4406	741.7916	783.3617	1263.4520	1934.9657	2623.7697	3297.3292	(97)
Space heating kWh													
	1599.4942	1041.8520	701.9352	230.2364	45.4471	0.0000	0.0000	0.0000	0.0000	352.1391	989.8071	1620.0421	(98a)
Space heating requirement - total per year (kWh/year)												6580.9532	
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													
	1599.4942	1041.8520	701.9352	230.2364	45.4471	0.0000	0.0000	0.0000	0.0000	352.1391	989.8071	1620.0421	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6580.9532	
Space heating per m2											(98c) / (4) =	35.7660	(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 %)												317.7295 (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													
	1599.4942	1041.8520	701.9352	230.2364	45.4471	0.0000	0.0000	0.0000	0.0000	352.1391	989.8071	1620.0421	(98)
Space heating efficiency (main heating system 1)													
	317.7295	317.7295	317.7295	317.7295	317.7295	0.0000	0.0000	0.0000	0.0000	317.7295	317.7295	317.7295	(210)
Space heating fuel (main heating system)													
	503.4137	327.9053	220.9222	72.4630	14.3037	0.0000	0.0000	0.0000	0.0000	110.8298	311.5251	509.8808	(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												
	293.1656	259.2066	275.0614	240.9124	232.9444	209.2471	205.9515	214.4377	217.1487	242.9423	259.3355	289.8262 (64)
Efficiency of water heater												166.8478 (216)
(217)m	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478 (217)
Fuel for water heating, kWh/month												
	175.7084	155.3551	164.8577	144.3905	139.6149	125.4120	123.4368	128.5229	130.1478	145.6071	155.4324	173.7070 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	49.2837	39.5373	35.5989	26.0813	20.1459	16.4594	18.3778	23.8882	31.0284	40.7109	45.9828	50.6535 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2071.2437 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	166.8478
Water heating fuel used	1762.1926 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	397.7481 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	4231.1844 (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	2071.2437	0.1573	325.7964	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1762.1926	0.1410	248.4081	(264)
Space and water heating			574.2045	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	397.7481	0.1443	57.4073	(268)
Total CO2, kg/year			631.6119	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4300	(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	2071.2437	1.5823	3277.2589	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1762.1926	1.5212	2680.7216	(278)
Space and water heating			5957.9806	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	397.7481	1.5338	610.0793	(282)
Total Primary energy kWh/year			6568.0599	(286)
Dwelling Primary energy Rate (DPER)			35.7000	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	80.0000 (1b)	x	2.4000 (2b)	=	192.0000 (1b)	-
First floor	64.0000 (1c)	x	2.4000 (2c)	=	153.6000 (1c)	-
Second floor	40.0000 (1d)	x	2.4000 (2d)	=	96.0000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	184.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	441.6000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0906	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3406	(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) =	0.2895	(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	0.3691	0.3619	0.3546	0.3184	0.3112	0.2750	0.2750	0.2678	0.2895	0.3112	0.3257	0.3402	(22b)
Effective ac	0.5681	0.5655	0.5629	0.5507	0.5484	0.5378	0.5378	0.5359	0.5419	0.5484	0.5530	0.5579	(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 Opening Type (Uw = 1.20)			46.0000	1.1450	52.6718			(27)
Heatloss Floor 1			80.0000	0.1300	10.4000			(28a)
External Wall 1	274.0000	46.0000	228.0000	0.1800	41.0400			(29a)
External Roof 1	64.0000		64.0000	0.1100	7.0400			(30)
External Roof 2	16.0000		16.0000	0.1100	1.7600			(30)
Total net area of external elements Aum(A, m2)			434.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		112.9118			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							276.5071	(35)

List of Thermal Bridges

	Length	Psi-value	Total
E5 Ground floor (normal)	46.0000	0.1600	7.3600
E6 Intermediate floor within a dwelling	66.0000	0.0000	0.0000
E16 Corner (normal)	28.8000	0.0900	2.5920
E2 Other lintels (including other steel lintels)	25.0000	0.0500	1.2500
E3 Sill	20.0000	0.0500	1.0000
E4 Jamb	60.0000	0.0500	3.0000
E10 Eaves (insulation at ceiling level)	20.0000	0.0600	1.2000
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		17.1220	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	130.0338	(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	82.7908	82.4053	82.0275	80.2528	79.9208	78.3751	78.3751	78.0888	78.9704	79.9208	80.5925	81.2947	(38)
Heat transfer coeff	212.8245	212.4391	212.0612	210.2866	209.9545	208.4088	208.4088	208.1226	209.0042	209.9545	210.6262	211.3285	(39)
Average = Sum(39)m / 12 =												210.2850	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1567	1.1546	1.1525	1.1429	1.1411	1.1327	1.1327	1.1311	1.1359	1.1411	1.1447	1.1485	(40)
HLP (average)												1.1429	

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												2.9811	(42)
Hot water usage for mixer showers													
	74.2024	73.0873	71.4623	68.3533	66.0589	63.5002	62.0459	63.6585	65.4263	68.1735	71.3493	73.9181	(42a)
Hot water usage for baths													
	32.0327	31.5569	30.8870	29.6518	28.7269	27.7013	27.1473	27.8125	28.5369	29.6343	30.8950	31.9244	(42b)
Hot water usage for other uses													
	45.1590	43.5169	41.8747	40.2326	38.5904	36.9483	36.9483	38.5904	40.2326	41.8747	43.5169	45.1590	(42c)
Average daily hot water use (litres/day)												139.1651	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	151.3941	148.1611	144.2241	138.2377	133.3762	128.1498	126.1414	130.0615	134.1957	139.6825	145.7612	151.0015	(44)
Energy conte	239.7712	210.9794	221.6670	189.2404	179.5500	157.5751	152.5571	161.0433	165.4767	189.5479	207.6635	236.4318	(45)
Energy content (annual)										Total = Sum(45)m =		2311.5035	
Distribution loss (46)m = 0.15 x (45)m													
	35.9657	31.6469	33.2501	28.3861	26.9325	23.6363	22.8836	24.1565	24.8215	28.4322	31.1495	35.4648	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	286.3661	253.0651	268.2619	234.3323	226.1449	202.6669	199.1520	207.6382	210.5686	236.1428	252.7553	283.0267	(62)
WWHRS	-33.9222	-30.0011	-31.4154	-26.0132	-24.2434	-20.7452	-19.4453	-20.6782	-21.4638	-25.3035	-28.6658	-33.2940	(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													
	252.4439	223.0640	236.8465	208.3191	201.9015	181.9217	179.7067	186.9600	189.1047	210.8393	224.0896	249.7327	(64)
										Total per year (kWh/year) = Sum(64)m =		2544.9297	(64)
12Total per year (kWh/year)												2545	(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													
	116.9999	103.8192	110.9802	98.9959	96.9763	88.4672	88.0012	90.8228	91.0945	100.3006	105.1216	115.8895	(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	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	179.3457	198.5614	179.3457	185.3239	179.3457	185.3239	179.3457	179.3457	185.3239	179.3457	185.3239	179.3457	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	355.5730	359.2627	349.9647	330.1704	305.1835	281.6994	266.0106	262.3209	271.6189	291.4132	316.4001	339.8842	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	(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)													
	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	(71)
Water heating gains (Table 5)													
	157.2579	154.4929	149.1669	137.4943	130.3445	122.8711	118.2811	122.0737	126.5201	134.8126	146.0022	155.7655	(72)
Total internal gains													
	762.8925	783.0329	749.1933	723.7045	685.5896	657.6103	631.3533	631.4561	651.1788	676.2875	718.4421	745.7113	(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	17.8500	10.6334	0.6300	0.7000	0.7700	58.0072	(74)
East	3.8800	19.6403	0.6300	0.7000	0.7700	23.2890	(76)
South	8.7000	46.7521	0.6300	0.7000	0.7700	124.3059	(78)
West	15.5700	19.6403	0.6300	0.7000	0.7700	93.4561	(80)

Solar gains	299.0583	542.8140	823.8019	1144.1930	1385.2542	1418.4237	1349.7171	1164.8668	934.8050	622.5294	364.4717	251.7749	(83)
Total gains	1061.9507	1325.8469	1572.9952	1867.8975	2070.8438	2076.0340	1981.0704	1796.3229	1585.9838	1298.8169	1082.9138	997.4862	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)													
tau	66.4049	66.5253	66.6439	67.2063	67.3126	67.8118	67.8118	67.9051	67.6187	67.3126	67.0979	66.8750	
alpha	5.4270	5.4350	5.4429	5.4804	5.4875	5.5208	5.5208	5.5270	5.5079	5.4875	5.4732	5.4583	
util living area	0.9990	0.9964	0.9871	0.9435	0.8199	0.6213	0.4593	0.5251	0.8034	0.9757	0.9973	0.9993	(86)
MIT	19.6613	19.8725	20.1821	20.5791	20.8629	20.9763	20.9962	20.9924	20.9095	20.5068	20.0059	19.6270	(87)
Th 2	19.9548	19.9565	19.9582	19.9660	19.9674	19.9743	19.9743	19.9755	19.9716	19.9674	19.9645	19.9614	(88)
util rest of house	0.9986	0.9951	0.9821	0.9221	0.7627	0.5311	0.3542	0.4124	0.7213	0.9626	0.9960	0.9990	(89)
MIT 2	18.3900	18.6613	19.0556	19.5484	19.8594	19.9622	19.9732	19.9732	19.9140	19.4725	18.8385	18.3509	(90)
Living area fraction										fLA = Living area / (4) =		0.1576	(91)
MIT	18.5903	18.8522	19.2331	19.7109	20.0176	20.1220	20.1345	20.1338	20.0709	19.6355	19.0225	18.5520	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5903	18.8522	19.2331	19.7109	20.0176	20.1220	20.1345	20.1338	20.0709	19.6355	19.0225	18.5520	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9930	0.9773	0.9156	0.7658	0.5446	0.3708	0.4302	0.7302	0.9569	0.9943	0.9984	(94)
Useful gains	1059.6590	1316.5461	1537.2167	1710.2400	1585.7823	1130.6659	734.6430	772.7817	1158.0155	1242.7955	1076.7176	995.9379	(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	3041.3348	2963.9896	2700.2009	2273.3772	1746.3124	1150.8428	736.6106	777.0955	1247.9506	1897.0476	2511.1882	3032.9901	(97)
Space heating kWh	1474.3667	1107.0820	865.2602	405.4588	119.4344	0.0000	0.0000	0.0000	0.0000	486.7636	1032.8189	1515.5669	(98a)
Space heating requirement - total per year (kWh/year)												7006.7515	
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	1474.3667	1107.0820	865.2602	405.4588	119.4344	0.0000	0.0000	0.0000	0.0000	486.7636	1032.8189	1515.5669	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7006.7515	
Space heating per m2											(98c) / (4) =	38.0802	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1474.3667	1107.0820	865.2602	405.4588	119.4344	0.0000	0.0000	0.0000	0.0000	486.7636	1032.8189	1515.5669	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	1597.3637	1199.4388	937.4433	439.2836	129.3981	0.0000	0.0000	0.0000	0.0000	527.3712	1118.9804	1642.0009	(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	252.4439	223.0640	236.8465	208.3191	201.9015	181.9217	179.7067	186.9600	189.1047	210.8393	224.0896	249.7327	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.3596	87.1517	86.6987	85.5262	82.9238	79.8000	79.8000	79.8000	79.8000	85.8729	87.0497	87.4054	(217)
Fuel for water heating, kWh/month	288.9708	255.9492	273.1836	243.5735	243.4785	227.9721	225.1964	234.2857	236.9734	245.5249	257.4273	285.7175	(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	37.2645	29.8950	26.9171	19.7206	15.2328	12.4453	13.8958	18.0624	23.4612	30.7824	34.7686	38.3002	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-70.2264	-96.7363	-135.8497	-149.0243	-157.4900	-145.6856	-143.6720	-137.0445	-125.0999	-108.6140	-76.3051	-60.9660	(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	-46.9093	-97.7473	-192.6615	-287.1381	-377.6576	-378.9010	-374.6390	-318.2979	-234.6269	-139.2801	-62.4434	-37.1844	(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	7591.2801 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3018.2527 (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)	300.7459 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3954.2004 (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	7042.0783 (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	7591.2801	0.2100	1594.1688	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3018.2527	0.2100	633.8331	(264)
Space and water heating			2228.0019	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	300.7459	0.1443	43.4069	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1406.7138	0.1351	-190.0809	
PV Unit electricity exported	-2547.4866	0.1261	-321.2718	
Total			-511.3528	(269)
Total CO2, kg/year			1771.9853	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6300	(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	7591.2801	1.1300	8578.1465	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3018.2527	1.1300	3410.6256	(278)
Space and water heating			11988.7721	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	300.7459	1.5338	461.2941	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1406.7138	1.4994	-2109.2632	
PV Unit electricity exported	-2547.4866	0.4629	-1179.3111	
Total			-3288.5742	(283)
Total Primary energy kWh/year			9291.5928	(286)
Target Primary Energy Rate (TPER)			50.5000	(287)

Full SAP Calculation Printout

Property Reference	House Type R	Issued on Date	05/10/2023
Assessment Reference	Plot 14	Prop Type Ref	
Property			

SAP Rating	85 B	DER	2.75	TER	7.25
Environmental	97 A	% DER < TER			62.07
CO_2 Emissions (t/year)	0.57	DFEE	30.32	TFEE	33.52
Compliance Check	See BREL	% DFEE < TFEE			9.54
% DPER < TPER	23.94	DPER	28.70	TPER	37.74

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	84.0000 (1b)	x	2.4000 (2b)	=	201.6000 (1b)	-
First floor	72.0000 (1c)	x	2.4000 (2c)	=	172.8000 (1c)	-
Second floor	72.0000 (1d)	x	2.4000 (2d)	=	172.8000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	228.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	547.2000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0183	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2183	(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) =	0.1855	(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	0.2366	0.2319	0.2273	0.2041	0.1994	0.1763	0.1763	0.1716	0.1855	0.1994	0.2087	0.2180	(22b)
Effective ac	0.5280	0.5269	0.5258	0.5208	0.5199	0.5155	0.5155	0.5147	0.5172	0.5199	0.5218	0.5238	(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	
Opening Type 1 (Uw = 1.20)			52.4000	1.1450	60.0000			(27)
Heatloss Floor 1			72.0000	0.1200	8.6400	110.0000	7920.0000	(28a)
External Wall 1	177.0000	52.4000	124.6000	0.1900	23.6740	190.0000	23674.0000	(29a)
External Roof 1	72.0000		72.0000	0.1500	10.8000	9.0000	648.0000	(30)
External Roof 2	12.0000		12.0000	0.1500	1.8000	9.0000	108.0000	(30)
Total net area of external elements Aum(A, m2)			333.0000					(31)

Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 104.9140 (33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 32350.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 141.8860 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E5 Ground floor (normal)	46.0000	0.0670	3.0820
	E6 Intermediate floor within a dwelling	66.0000	0.0020	0.1320
	E16 Corner (normal)	28.8000	0.0410	1.1808
	E2 Other lintels (including other steel lintels)	25.0000	0.0240	0.6000
	E3 Sill	20.0000	0.0190	0.3800
	E4 Jamb	60.0000	0.0140	0.8400
	E10 Eaves (insulation at ceiling level)	20.0000	0.0460	0.9200
	E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5308 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 112.4448 (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	95.3404	95.1442	94.9519	94.0486	93.8796	93.0929	93.0929	92.9472	93.3960	93.8796	94.2215	94.5789	(38)
Heat transfer coeff	207.7852	207.5890	207.3967	206.4934	206.3244	205.5377	205.5377	205.3920	205.8408	206.3244	206.6663	207.0237	(39)

Average = Sum(39)m / 12 = 206.4926

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9113	0.9105	0.9096	0.9057	0.9049	0.9015	0.9015	0.9008	0.9028	0.9049	0.9064	0.9080	(40)
HLP (average)												0.9057	
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 3.0383 (42)
Hot water usage for mixer showers

75.1627	74.0331	72.3871	69.2379	66.9138	64.3220	62.8488	64.4823	66.2730	69.0558	72.2727	74.8747	(42a)

Hot water usage for baths

32.4456	31.9638	31.2852	30.0341	29.0972	28.0584	27.4973	28.1711	28.9048	30.0163	31.2932	32.3359	(42b)

Hot water usage for other uses

45.7455	44.0821	42.4186	40.7551	39.0916	37.4282	37.4282	39.0916	40.7551	42.4186	44.0821	45.7455	(42c)

Average daily hot water use (litres/day) 140.9665 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	153.3538	150.0790	146.0909	140.0270	135.1026	129.8085	127.7743	131.7451	135.9328	141.4907	147.6480	152.9562	(44)
Energy conte	242.8750	213.7104	224.5363	191.6900	181.8741	159.6148	154.5319	163.1279	167.6188	192.0015	210.3516	239.4924	(45)

Energy content (annual) Total = Sum(45)m = 2341.4248

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

36.4312	32.0566	33.6805	28.7535	27.2811	23.9422	23.1798	24.4692	25.1428	28.8002	31.5527	35.9239	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

296.2694	261.9376	277.9307	243.3620	235.2685	211.2868	207.9263	216.5223	219.2908	245.3959	262.0236	292.8868	(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

296.2694	261.9376	277.9307	243.3620	235.2685	211.2868	207.9263	216.5223	219.2908	245.3959	262.0236	292.8868	(64)

Total per year (kWh/year) = Sum(64)m = 2970.1008 (64)
12Total per year (kWh/year) 2970 (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

123.4715	109.6405	117.3739	105.0745	103.1887	94.4095	94.0974	96.9555	97.0708	106.5560	111.2795	122.3467	(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	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	200.2084	221.6593	200.2084	206.8820	200.2084	206.8820	200.2084	200.2084	206.8820	200.2084	206.8820	200.2084	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.9356	401.0546	390.6749	368.5780	340.6845	314.4686	296.9547	292.8358	303.2154	325.3124	353.2058	379.4218	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	(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)													

	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332 (71)
Water heating gains (Table 5)												
	165.9563	163.1555	157.7606	145.9369	138.6944	131.1243	126.4750	130.3166	134.8206	143.2205	154.5549	164.4445 (72)
Total internal gains												
	831.6752	854.4443	817.2189	789.9718	748.1623	721.0499	692.2130	691.9357	713.4930	737.3162	783.2177	812.6497 (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	23.4000	10.6334	0.7600	0.7000	0.7700	91.7345 (74)
East	8.5000	19.6403	0.7600	0.7000	0.7700	61.5476 (76)
South	16.5000	46.7521	0.7600	0.7000	0.7700	284.4000 (78)
West	4.0000	19.6403	0.7600	0.7000	0.7700	28.9636 (80)

Solar gains	466.6457	818.1423	1182.7977	1574.3341	1864.5344	1896.0373	1809.2246	1585.5178	1317.0826	921.1592	563.1341	396.6542 (83)
Total gains	1298.3209	1672.5866	2000.0166	2364.3059	2612.6967	2617.0871	2501.4377	2277.4535	2030.5756	1658.4754	1346.3518	1209.3038 (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	43.2471	43.2880	43.3281	43.5177	43.5533	43.7200	43.7200	43.7510	43.6556	43.5533	43.4813	43.4062	
alpha	3.8831	3.8859	3.8885	3.9012	3.9036	3.9147	3.9147	3.9167	3.9104	3.9036	3.8988	3.8937	
util living area													
	0.9861	0.9649	0.9206	0.8173	0.6595	0.4851	0.3572	0.4070	0.6366	0.8842	0.9716	0.9893	(86)
Living	19.3251	19.6776	20.1077	20.5662	20.8499	20.9648	20.9917	20.9863	20.9022	20.4793	19.8015	19.2530	
Non living	18.1771	18.6231	19.1590	19.7110	20.0262	20.1410	20.1621	20.1594	20.0873	19.6236	18.7864	18.0873	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	0	0	0	0	0	0	0	0	0	0	12	
16 / 9	0	28	31	0	0	0	0	0	0	0	19	19	
MIT	21.0000	20.2511	20.4946	20.5662	20.8499	20.9648	20.9917	20.9863	20.9022	20.4793	20.1307	20.3936	(87)
Th 2	20.1579	20.1586	20.1593	20.1627	20.1633	20.1662	20.1662	20.1668	20.1651	20.1633	20.1620	20.1607	(88)
util rest of house													
	0.9835	0.9587	0.9071	0.7894	0.6150	0.4273	0.2913	0.3364	0.5759	0.8588	0.9656	0.9872	(89)
MIT 2	20.1579	19.4809	19.7178	19.7110	20.0262	20.1410	20.1621	20.1594	20.0873	19.6236	19.2731	19.5998	(90)
Living area fraction										fLA = Living area / (4) =		0.0833	(91)
MIT	20.2281	19.5450	19.7825	19.7823	20.0948	20.2096	20.2312	20.2283	20.1553	19.6949	19.3446	19.6659	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2281	19.5450	19.7825	19.7823	20.0948	20.2096	20.2312	20.2283	20.1553	19.6949	19.3446	19.6659	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9534	0.9003	0.7753	0.6111	0.4304	0.2965	0.3417	0.5751	0.8421	0.9581	0.9858	(94)
Useful gains	1277.2582	1594.5811	1800.5367	1832.9435	1596.6987	1126.4557	741.7334	778.2719	1167.8804	1396.5606	1289.9757	1192.1743	(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													
	3309.6127	3040.1504	2754.7545	2247.1211	1732.0530	1152.9884	746.3467	786.3077	1246.4177	1876.5090	2530.5385	3201.8166	(97)
Space heating kWh													
	1512.0718	971.4226	709.9380	298.2079	100.7036	0.0000	0.0000	0.0000	0.0000	357.0816	893.2052	1495.1738	(98a)
Space heating requirement - total per year (kWh/year)												6337.8045	
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													
	1512.0718	971.4226	709.9380	298.2079	100.7036	0.0000	0.0000	0.0000	0.0000	357.0816	893.2052	1495.1738	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6337.8045	
Space heating per m2											(98c) / (4) =	27.7974	(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 %)	317.4990 (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													
	1512.0718	971.4226	709.9380	298.2079	100.7036	0.0000	0.0000	0.0000	0.0000	357.0816	893.2052	1495.1738	(98)
Space heating efficiency (main heating system 1)													
	317.4990	317.4990	317.4990	317.4990	317.4990	0.0000	0.0000	0.0000	0.0000	317.4990	317.4990	317.4990	(210)
Space heating fuel (main heating system)													
	476.2445	305.9608	223.6032	93.9240	31.7178	0.0000	0.0000	0.0000	0.0000	112.4670	281.3253	470.9223	(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												
	296.2694	261.9376	277.9307	243.3620	235.2685	211.2868	207.9263	216.5223	219.2908	245.3959	262.0236	292.8868 (64)
Efficiency of water heater												167.0527 (216)
(217)m	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527 (217)
Fuel for water heating, kWh/month												
	177.3509	156.7994	166.3731	145.6798	140.8349	126.4791	124.4675	129.6132	131.2704	146.8973	156.8509	175.3260 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	55.3618	44.4133	39.9893	29.2979	22.6305	18.4893	20.6443	26.8343	34.8550	45.7317	51.6539	56.9005 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1996.1650 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	167.0527
Water heating fuel used	1777.9423 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	446.8018 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	4220.9091 (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	1996.1650	0.1568	312.9467	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1777.9423	0.1410	250.6393	(264)
Space and water heating			563.5860	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	446.8018	0.1443	64.4873	(268)
Total CO2, kg/year			628.0733	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.7500	(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	1996.1650	1.5803	3154.6318	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1777.9423	1.5213	2704.7219	(278)
Space and water heating			5859.3537	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	446.8018	1.5338	685.3196	(282)
Total Primary energy kWh/year			6544.6733	(286)
Dwelling Primary energy Rate (DPER)			28.7000	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	84.0000 (1b)	x	2.4000 (2b)	=	201.6000 (1b)	-
First floor	72.0000 (1c)	x	2.4000 (2c)	=	172.8000 (1c)	-
Second floor	72.0000 (1d)	x	2.4000 (2d)	=	172.8000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	228.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	547.2000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0731 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3231 (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) =	0.2746 (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	0.3502	0.3433	0.3364	0.3021	0.2952	0.2609	0.2609	0.2540	0.2746	0.2952	0.3090	0.3227	(22b)
Effective ac	0.5613	0.5589	0.5566	0.5456	0.5436	0.5340	0.5340	0.5323	0.5377	0.5436	0.5477	0.5521	(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 Opening Type (Uw = 1.20)			52.4000	1.1450	60.0000			(27)
Heatloss Floor 1			72.0000	0.1300	9.3600			(28a)
External Wall 1	177.0000	52.4000	124.6000	0.1800	22.4280			(29a)
External Roof 1	72.0000		72.0000	0.1100	7.9200			(30)
External Roof 2	12.0000		12.0000	0.1100	1.3200			(30)
Total net area of external elements Aum(A, m2)			333.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	101.0280			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 141.8860 (35)

List of Thermal Bridges

	Length	Psi-value	Total
E5 Ground floor (normal)	46.0000	0.1600	7.3600
E6 Intermediate floor within a dwelling	66.0000	0.0000	0.0000
E16 Corner (normal)	28.8000	0.0900	2.5920
E2 Other lintels (including other steel lintels)	25.0000	0.0500	1.2500
E3 Sill	20.0000	0.0500	1.0000
E4 Jamb	60.0000	0.0500	3.0000
E10 Eaves (insulation at ceiling level)	20.0000	0.0600	1.2000
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.1220 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 118.1500 (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	101.3583	100.9285	100.5071	98.5280	98.1577	96.4339	96.4339	96.1147	97.0979	98.1577	98.9068	99.6899	(38)
Heat transfer coeff	219.5083	219.0785	218.6571	216.6780	216.3077	214.5839	214.5839	214.2647	215.2479	216.3077	217.0568	217.8399	(39)

Average = Sum(39)m / 12 = 216.6762

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9628	0.9609	0.9590	0.9503	0.9487	0.9412	0.9412	0.9398	0.9441	0.9487	0.9520	0.9554	(40)
HLP (average)												0.9503	

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												3.0383	(42)
Hot water usage for mixer showers													
	75.1627	74.0331	72.3871	69.2379	66.9138	64.3220	62.8488	64.4823	66.2730	69.0558	72.2727	74.8747	(42a)
Hot water usage for baths													
	32.4456	31.9638	31.2852	30.0341	29.0972	28.0584	27.4973	28.1711	28.9048	30.0163	31.2932	32.3359	(42b)
Hot water usage for other uses													
	45.7455	44.0821	42.4186	40.7551	39.0916	37.4282	37.4282	39.0916	40.7551	42.4186	44.0821	45.7455	(42c)
Average daily hot water use (litres/day)												140.9665	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	153.3538	150.0790	146.0909	140.0270	135.1026	129.8085	127.7743	131.7451	135.9328	141.4907	147.6480	152.9562	(44)
Energy conte	242.8750	213.7104	224.5363	191.6900	181.8741	159.6148	154.5319	163.1279	167.6188	192.0015	210.3516	239.4924	(45)
Energy content (annual)											Total = Sum(45)m =	2341.4248	
Distribution loss (46)m = 0.15 x (45)m													
	36.4312	32.0566	33.6805	28.7535	27.2811	23.9422	23.1798	24.4692	25.1428	28.8002	31.5527	35.9239	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	289.4699	255.7961	271.1312	236.7819	228.4690	204.7066	201.1268	209.7228	212.7106	238.5964	255.4435	286.0873	(62)
WWHRS	-34.3612	-30.3894	-31.8220	-26.3499	-24.5571	-21.0137	-19.6970	-20.9458	-21.7416	-25.6309	-29.0367	-33.7249	(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													
	255.1087	225.4068	239.3093	210.4320	203.9119	183.6929	181.4298	188.7770	190.9690	212.9655	226.4067	252.3624	(64)
										Total per year (kWh/year) = Sum(64)m =		2570.7720	(64)
12Total per year (kWh/year)												2571	(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													
	118.0319	104.7273	111.9343	99.8104	97.7491	89.1454	88.6578	91.5160	91.8067	101.1164	106.0154	116.9071	(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	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	200.2084	221.6593	200.2084	206.8820	200.2084	206.8820	200.2084	200.2084	206.8820	200.2084	206.8820	200.2084	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	396.9356	401.0546	390.6749	368.5780	340.6845	314.4686	296.9547	292.8358	303.2154	325.3124	353.2058	379.4218	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	(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)													
	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	(71)
Water heating gains (Table 5)													
	158.6450	155.8442	150.4493	138.6256	131.3832	123.8130	119.1637	123.0053	127.5093	135.9092	147.2436	157.1333	(72)
Total internal gains													
	827.3640	850.1330	812.9076	785.6605	743.8510	713.7386	684.9018	684.6244	706.1817	733.0049	778.9064	808.3384	(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	23.4000	10.6334	0.6300	0.7000	0.7700	76.0430	(74)
East	8.5000	19.6403	0.6300	0.7000	0.7700	51.0197	(76)
South	16.5000	46.7521	0.6300	0.7000	0.7700	235.7526	(78)
West	4.0000	19.6403	0.6300	0.7000	0.7700	24.0093	(80)

Solar gains	386.8247	678.1969	980.4770	1305.0401	1545.6009	1571.7151	1499.7520	1314.3108	1091.7921	763.5925	466.8085	328.8054	(83)
Total gains	1214.1886	1528.3299	1793.3846	2090.7006	2289.4519	2285.4537	2184.6538	1998.9352	1797.9738	1496.5974	1245.7149	1137.1438	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)													
tau	40.9374	41.0178	41.0968	41.4722	41.5432	41.8769	41.8769	41.9393	41.7477	41.5432	41.3998	41.2510	
alpha	3.7292	3.7345	3.7398	3.7648	3.7695	3.7918	3.7918	3.7960	3.7832	3.7695	3.7600	3.7501	
util living area	0.9891	0.9746	0.9447	0.8691	0.7365	0.5628	0.4218	0.4754	0.7097	0.9159	0.9786	0.9914	(86)
MIT	19.1429	19.4639	19.8865	20.3914	20.7537	20.9340	20.9828	20.9732	20.8415	20.3352	19.6410	19.0879	(87)
Th 2	20.1145	20.1161	20.1176	20.1249	20.1263	20.1327	20.1327	20.1338	20.1302	20.1263	20.1235	20.1206	(88)
util rest of house	0.9870	0.9698	0.9343	0.8454	0.6925	0.4977	0.3429	0.3927	0.6478	0.8952	0.9738	0.9897	(89)
MIT 2	17.9169	18.3252	18.8575	19.4799	19.8959	20.0842	20.1239	20.1192	20.0007	19.4265	18.5584	17.8508	(90)
Living area fraction										fLA = Living area / (4) =		0.0833	(91)
MIT	18.0191	18.4201	18.9433	19.5558	19.9674	20.1550	20.1955	20.1904	20.0707	19.5022	18.6486	17.9539	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0191	18.4201	18.9433	19.5558	19.9674	20.1550	20.1955	20.1904	20.0707	19.5022	18.6486	17.9539	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9796	0.9572	0.9167	0.8274	0.6838	0.4994	0.3487	0.3983	0.6432	0.8768	0.9624	0.9834	(94)
Useful gains	1189.3593	1462.9757	1644.0741	1729.9280	1565.4512	1141.4600	761.8232	796.1422	1156.4351	1312.2603	1198.8303	1118.3039	(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	3011.4506	2961.9666	2720.8092	2308.8817	1788.2982	1192.0243	771.5310	812.1444	1285.1869	1925.6236	2506.7072	2996.1511	(97)
Space heating kWh	1355.6359	1007.3219	801.0909	416.8466	165.7982	0.0000	0.0000	0.0000	0.0000	456.3423	941.6714	1397.1183	(98a)
Space heating requirement - total per year (kWh/year)												6541.8254	
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	1355.6359	1007.3219	801.0909	416.8466	165.7982	0.0000	0.0000	0.0000	0.0000	456.3423	941.6714	1397.1183	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6541.8254	
Space heating per m2											(98c) / (4) =	28.6922	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1355.6359	1007.3219	801.0909	416.8466	165.7982	0.0000	0.0000	0.0000	0.0000	456.3423	941.6714	1397.1183	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	1468.7279	1091.3563	867.9208	451.6215	179.6297	0.0000	0.0000	0.0000	0.0000	494.4120	1020.2290	1513.6710	(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	255.1087	225.4068	239.3093	210.4320	203.9119	183.6929	181.4298	188.7770	190.9690	212.9655	226.4067	252.3624	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2417	87.0057	86.5546	85.5628	83.5997	79.8000	79.8000	79.8000	79.8000	85.7237	86.9003	87.2937	(217)
Fuel for water heating, kWh/month	292.4161	259.0712	276.4835	245.9388	243.9145	230.1916	227.3556	236.5627	239.3096	248.4324	260.5361	289.0956	(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	41.5994	33.3725	30.0483	22.0147	17.0048	13.8930	15.5123	20.1635	26.1904	34.3632	38.8131	42.7555	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-74.8014	-103.5784	-146.1985	-161.1976	-171.0032	-158.3815	-156.1641	-148.6305	-135.1745	-116.6541	-81.4577	-64.8701	(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	-48.1911	-100.6294	-198.7383	-296.7729	-390.9017	-392.4344	-388.0625	-329.4791	-242.5386	-143.6347	-64.2282	-38.1879	(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	7087.5681 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3049.3077 (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)	335.7306 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-4151.9105 (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	6406.6960 (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	7087.5681	0.2100	1488.3893	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3049.3077	0.2100	640.3546	(264)
Space and water heating			2128.7439	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	335.7306	0.1443	48.4563	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1518.1116	0.1350	-204.9740	
PV Unit electricity exported	-2633.7988	0.1261	-331.9966	
Total			-536.9706	(269)
Total CO2, kg/year			1652.1589	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.2500	(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	7087.5681	1.1300	8008.9520	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3049.3077	1.1300	3445.7177	(278)
Space and water heating			11454.6697	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	335.7306	1.5338	514.9549	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1518.1116	1.4990	-2275.6980	
PV Unit electricity exported	-2633.7988	0.4627	-1218.6712	
Total			-3494.3692	(283)
Total Primary energy kWh/year			8605.3562	(286)
Target Primary Energy Rate (TPER)			37.7400	(287)

Full SAP Calculation Printout

Property Reference	House Type R	Issued on Date	05/10/2023
Assessment Reference	Plot 15	Prop Type Ref	
Property			

SAP Rating	85 B	DER	2.75	TER	7.25
Environmental	97 A	% DER < TER			62.07
CO_2 Emissions (t/year)	0.57	DFEE	30.32	TFEE	33.52
Compliance Check	See BREL	% DFEE < TFEE			9.54
% DPER < TPER	23.94	DPER	28.70	TPER	37.74

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	84.0000 (1b)	x	2.4000 (2b)	=	201.6000 (1b)	-
First floor	72.0000 (1c)	x	2.4000 (2c)	=	172.8000 (1c)	-
Second floor	72.0000 (1d)	x	2.4000 (2d)	=	172.8000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	228.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	547.2000	(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	1 * 10	=	10.0000 (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) =	10.0000 / (5)	=	0.0183 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			4.0000 (17)
Infiltration rate			0.2183 (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)	=	0.1855 (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	0.2366	0.2319	0.2273	0.2041	0.1994	0.1763	0.1763	0.1716	0.1855	0.1994	0.2087	0.2180	(22b)
Effective ac	0.5280	0.5269	0.5258	0.5208	0.5199	0.5155	0.5155	0.5147	0.5172	0.5199	0.5218	0.5238	(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	
Opening Type 1 (Uw = 1.20)			52.4000	1.1450	60.0000			(27)
Heatloss Floor 1			72.0000	0.1200	8.6400	110.0000	7920.0000	(28a)
External Wall 1	177.0000	52.4000	124.6000	0.1900	23.6740	190.0000	23674.0000	(29a)
External Roof 1	72.0000		72.0000	0.1500	10.8000	9.0000	648.0000	(30)
External Roof 2	12.0000		12.0000	0.1500	1.8000	9.0000	108.0000	(30)
Total net area of external elements Aum(A, m2)			333.0000					(31)

Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 104.9140 (33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 32350.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 141.8860 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E5 Ground floor (normal)	46.0000	0.0670	3.0820
	E6 Intermediate floor within a dwelling	66.0000	0.0020	0.1320
	E16 Corner (normal)	28.8000	0.0410	1.1808
	E2 Other lintels (including other steel lintels)	25.0000	0.0240	0.6000
	E3 Sill	20.0000	0.0190	0.3800
	E4 Jamb	60.0000	0.0140	0.8400
	E10 Eaves (insulation at ceiling level)	20.0000	0.0460	0.9200
	E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5308 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 112.4448 (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	95.3404	95.1442	94.9519	94.0486	93.8796	93.0929	93.0929	92.9472	93.3960	93.8796	94.2215	94.5789	(38)
Heat transfer coeff	207.7852	207.5890	207.3967	206.4934	206.3244	205.5377	205.5377	205.3920	205.8408	206.3244	206.6663	207.0237	(39)

Average = Sum(39)m / 12 = 206.4926

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9113	0.9105	0.9096	0.9057	0.9049	0.9015	0.9015	0.9008	0.9028	0.9049	0.9064	0.9080	(40)
HLP (average)												0.9057	
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 3.0383 (42)
Hot water usage for mixer showers

75.1627	74.0331	72.3871	69.2379	66.9138	64.3220	62.8488	64.4823	66.2730	69.0558	72.2727	74.8747	(42a)

Hot water usage for baths

32.4456	31.9638	31.2852	30.0341	29.0972	28.0584	27.4973	28.1711	28.9048	30.0163	31.2932	32.3359	(42b)

Hot water usage for other uses

45.7455	44.0821	42.4186	40.7551	39.0916	37.4282	37.4282	39.0916	40.7551	42.4186	44.0821	45.7455	(42c)

Average daily hot water use (litres/day) 140.9665 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	153.3538	150.0790	146.0909	140.0270	135.1026	129.8085	127.7743	131.7451	135.9328	141.4907	147.6480	152.9562	(44)
Energy conte	242.8750	213.7104	224.5363	191.6900	181.8741	159.6148	154.5319	163.1279	167.6188	192.0015	210.3516	239.4924	(45)

Energy content (annual) Total = Sum(45)m = 2341.4248

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

36.4312	32.0566	33.6805	28.7535	27.2811	23.9422	23.1798	24.4692	25.1428	28.8002	31.5527	35.9239	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

296.2694	261.9376	277.9307	243.3620	235.2685	211.2868	207.9263	216.5223	219.2908	245.3959	262.0236	292.8868	(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

296.2694	261.9376	277.9307	243.3620	235.2685	211.2868	207.9263	216.5223	219.2908	245.3959	262.0236	292.8868	(64)

Total per year (kWh/year) = Sum(64)m = 2970.1008 (64)
12Total per year (kWh/year) 2970 (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

123.4715	109.6405	117.3739	105.0745	103.1887	94.4095	94.0974	96.9555	97.0708	106.5560	111.2795	122.3467	(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	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	200.2084	221.6593	200.2084	206.8820	200.2084	206.8820	200.2084	200.2084	206.8820	200.2084	206.8820	200.2084	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.9356	401.0546	390.6749	368.5780	340.6845	314.4686	296.9547	292.8358	303.2154	325.3124	353.2058	379.4218	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	(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)													

	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332 (71)
Water heating gains (Table 5)												
	165.9563	163.1555	157.7606	145.9369	138.6944	131.1243	126.4750	130.3166	134.8206	143.2205	154.5549	164.4445 (72)
Total internal gains												
	831.6752	854.4443	817.2189	789.9718	748.1623	721.0499	692.2130	691.9357	713.4930	737.3162	783.2177	812.6497 (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	23.4000	10.6334	0.7600	0.7000	0.7700	91.7345 (74)
East	8.5000	19.6403	0.7600	0.7000	0.7700	61.5476 (76)
South	16.5000	46.7521	0.7600	0.7000	0.7700	284.4000 (78)
West	4.0000	19.6403	0.7600	0.7000	0.7700	28.9636 (80)

Solar gains	466.6457	818.1423	1182.7977	1574.3341	1864.5344	1896.0373	1809.2246	1585.5178	1317.0826	921.1592	563.1341	396.6542 (83)
Total gains	1298.3209	1672.5866	2000.0166	2364.3059	2612.6967	2617.0871	2501.4377	2277.4535	2030.5756	1658.4754	1346.3518	1209.3038 (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	43.2471	43.2880	43.3281	43.5177	43.5533	43.7200	43.7200	43.7510	43.6556	43.5533	43.4813	43.4062	
alpha	3.8831	3.8859	3.8885	3.9012	3.9036	3.9147	3.9147	3.9167	3.9104	3.9036	3.8988	3.8937	
util living area													
	0.9861	0.9649	0.9206	0.8173	0.6595	0.4851	0.3572	0.4070	0.6366	0.8842	0.9716	0.9893	(86)
Living	19.3251	19.6776	20.1077	20.5662	20.8499	20.9648	20.9917	20.9863	20.9022	20.4793	19.8015	19.2530	
Non living	18.1771	18.6231	19.1590	19.7110	20.0262	20.1410	20.1621	20.1594	20.0873	19.6236	18.7864	18.0873	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	0	0	0	0	0	0	0	0	0	0	12	
16 / 9	0	28	31	0	0	0	0	0	0	0	19	19	
MIT	21.0000	20.2511	20.4946	20.5662	20.8499	20.9648	20.9917	20.9863	20.9022	20.4793	20.1307	20.3936	(87)
Th 2	20.1579	20.1586	20.1593	20.1627	20.1633	20.1662	20.1662	20.1668	20.1651	20.1633	20.1620	20.1607	(88)
util rest of house													
	0.9835	0.9587	0.9071	0.7894	0.6150	0.4273	0.2913	0.3364	0.5759	0.8588	0.9656	0.9872	(89)
MIT 2	20.1579	19.4809	19.7178	19.7110	20.0262	20.1410	20.1621	20.1594	20.0873	19.6236	19.2731	19.5998	(90)
Living area fraction										fLA = Living area / (4) =		0.0833	(91)
MIT	20.2281	19.5450	19.7825	19.7823	20.0948	20.2096	20.2312	20.2283	20.1553	19.6949	19.3446	19.6659	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2281	19.5450	19.7825	19.7823	20.0948	20.2096	20.2312	20.2283	20.1553	19.6949	19.3446	19.6659	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9534	0.9003	0.7753	0.6111	0.4304	0.2965	0.3417	0.5751	0.8421	0.9581	0.9858	(94)
Useful gains	1277.2582	1594.5811	1800.5367	1832.9435	1596.6987	1126.4557	741.7334	778.2719	1167.8804	1396.5606	1289.9757	1192.1743	(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													
	3309.6127	3040.1504	2754.7545	2247.1211	1732.0530	1152.9884	746.3467	786.3077	1246.4177	1876.5090	2530.5385	3201.8166	(97)
Space heating kWh													
	1512.0718	971.4226	709.9380	298.2079	100.7036	0.0000	0.0000	0.0000	0.0000	357.0816	893.2052	1495.1738	(98a)
Space heating requirement - total per year (kWh/year)												6337.8045	
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													
	1512.0718	971.4226	709.9380	298.2079	100.7036	0.0000	0.0000	0.0000	0.0000	357.0816	893.2052	1495.1738	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6337.8045	
Space heating per m2											(98c) / (4) =	27.7974	(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 %)	317.4990 (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													
	1512.0718	971.4226	709.9380	298.2079	100.7036	0.0000	0.0000	0.0000	0.0000	357.0816	893.2052	1495.1738	(98)
Space heating efficiency (main heating system 1)													
	317.4990	317.4990	317.4990	317.4990	317.4990	0.0000	0.0000	0.0000	0.0000	317.4990	317.4990	317.4990	(210)
Space heating fuel (main heating system)													
	476.2445	305.9608	223.6032	93.9240	31.7178	0.0000	0.0000	0.0000	0.0000	112.4670	281.3253	470.9223	(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												
	296.2694	261.9376	277.9307	243.3620	235.2685	211.2868	207.9263	216.5223	219.2908	245.3959	262.0236	292.8868 (64)
Efficiency of water heater												167.0527 (216)
(217)m	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527 (217)
Fuel for water heating, kWh/month												
	177.3509	156.7994	166.3731	145.6798	140.8349	126.4791	124.4675	129.6132	131.2704	146.8973	156.8509	175.3260 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	55.3618	44.4133	39.9893	29.2979	22.6305	18.4893	20.6443	26.8343	34.8550	45.7317	51.6539	56.9005 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1996.1650 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	167.0527
Water heating fuel used	1777.9423 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	446.8018 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	4220.9091 (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	1996.1650	0.1568	312.9467	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1777.9423	0.1410	250.6393	(264)
Space and water heating			563.5860	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	446.8018	0.1443	64.4873	(268)
Total CO2, kg/year			628.0733	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.7500	(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	1996.1650	1.5803	3154.6318	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1777.9423	1.5213	2704.7219	(278)
Space and water heating			5859.3537	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	446.8018	1.5338	685.3196	(282)
Total Primary energy kWh/year			6544.6733	(286)
Dwelling Primary energy Rate (DPER)			28.7000	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	84.0000 (1b)	x	2.4000 (2b)	=	201.6000 (1b)	-
First floor	72.0000 (1c)	x	2.4000 (2c)	=	172.8000 (1c)	-
Second floor	72.0000 (1d)	x	2.4000 (2d)	=	172.8000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	228.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	547.2000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0731 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3231 (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) =	0.2746 (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	0.3502	0.3433	0.3364	0.3021	0.2952	0.2609	0.2609	0.2540	0.2746	0.2952	0.3090	0.3227	(22b)
Effective ac	0.5613	0.5589	0.5566	0.5456	0.5436	0.5340	0.5340	0.5323	0.5377	0.5436	0.5477	0.5521	(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 Opening Type (Uw = 1.20)			52.4000	1.1450	60.0000			(27)
Heatloss Floor 1			72.0000	0.1300	9.3600			(28a)
External Wall 1	177.0000	52.4000	124.6000	0.1800	22.4280			(29a)
External Roof 1	72.0000		72.0000	0.1100	7.9200			(30)
External Roof 2	12.0000		12.0000	0.1100	1.3200			(30)
Total net area of external elements Aum(A, m2)			333.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	101.0280			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 141.8860 (35)

List of Thermal Bridges

	Length	Psi-value	Total
E5 Ground floor (normal)	46.0000	0.1600	7.3600
E6 Intermediate floor within a dwelling	66.0000	0.0000	0.0000
E16 Corner (normal)	28.8000	0.0900	2.5920
E2 Other lintels (including other steel lintels)	25.0000	0.0500	1.2500
E3 Sill	20.0000	0.0500	1.0000
E4 Jamb	60.0000	0.0500	3.0000
E10 Eaves (insulation at ceiling level)	20.0000	0.0600	1.2000
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.1220 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 118.1500 (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	101.3583	100.9285	100.5071	98.5280	98.1577	96.4339	96.4339	96.1147	97.0979	98.1577	98.9068	99.6899	(38)
Heat transfer coeff	219.5083	219.0785	218.6571	216.6780	216.3077	214.5839	214.5839	214.2647	215.2479	216.3077	217.0568	217.8399	(39)

Average = Sum(39)m / 12 = 216.6762

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9628	0.9609	0.9590	0.9503	0.9487	0.9412	0.9412	0.9398	0.9441	0.9487	0.9520	0.9554	(40)
HLP (average)												0.9503	

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												3.0383	(42)
Hot water usage for mixer showers													
	75.1627	74.0331	72.3871	69.2379	66.9138	64.3220	62.8488	64.4823	66.2730	69.0558	72.2727	74.8747	(42a)
Hot water usage for baths													
	32.4456	31.9638	31.2852	30.0341	29.0972	28.0584	27.4973	28.1711	28.9048	30.0163	31.2932	32.3359	(42b)
Hot water usage for other uses													
	45.7455	44.0821	42.4186	40.7551	39.0916	37.4282	37.4282	39.0916	40.7551	42.4186	44.0821	45.7455	(42c)
Average daily hot water use (litres/day)												140.9665	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	153.3538	150.0790	146.0909	140.0270	135.1026	129.8085	127.7743	131.7451	135.9328	141.4907	147.6480	152.9562	(44)
Energy conte	242.8750	213.7104	224.5363	191.6900	181.8741	159.6148	154.5319	163.1279	167.6188	192.0015	210.3516	239.4924	(45)
Energy content (annual)											Total = Sum(45)m =	2341.4248	
Distribution loss (46)m = 0.15 x (45)m													
	36.4312	32.0566	33.6805	28.7535	27.2811	23.9422	23.1798	24.4692	25.1428	28.8002	31.5527	35.9239	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	289.4699	255.7961	271.1312	236.7819	228.4690	204.7066	201.1268	209.7228	212.7106	238.5964	255.4435	286.0873	(62)
WWHRS	-34.3612	-30.3894	-31.8220	-26.3499	-24.5571	-21.0137	-19.6970	-20.9458	-21.7416	-25.6309	-29.0367	-33.7249	(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													
	255.1087	225.4068	239.3093	210.4320	203.9119	183.6929	181.4298	188.7770	190.9690	212.9655	226.4067	252.3624	(64)
										Total per year (kWh/year) = Sum(64)m =		2570.7720	(64)
12Total per year (kWh/year)												2571	(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													
	118.0319	104.7273	111.9343	99.8104	97.7491	89.1454	88.6578	91.5160	91.8067	101.1164	106.0154	116.9071	(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	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	200.2084	221.6593	200.2084	206.8820	200.2084	206.8820	200.2084	200.2084	206.8820	200.2084	206.8820	200.2084	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	396.9356	401.0546	390.6749	368.5780	340.6845	314.4686	296.9547	292.8358	303.2154	325.3124	353.2058	379.4218	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	(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)													
	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	(71)
Water heating gains (Table 5)													
	158.6450	155.8442	150.4493	138.6256	131.3832	123.8130	119.1637	123.0053	127.5093	135.9092	147.2436	157.1333	(72)
Total internal gains													
	827.3640	850.1330	812.9076	785.6605	743.8510	713.7386	684.9018	684.6244	706.1817	733.0049	778.9064	808.3384	(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	23.4000	10.6334	0.6300	0.7000	0.7700	76.0430	(74)
East	8.5000	19.6403	0.6300	0.7000	0.7700	51.0197	(76)
South	16.5000	46.7521	0.6300	0.7000	0.7700	235.7526	(78)
West	4.0000	19.6403	0.6300	0.7000	0.7700	24.0093	(80)

Solar gains	386.8247	678.1969	980.4770	1305.0401	1545.6009	1571.7151	1499.7520	1314.3108	1091.7921	763.5925	466.8085	328.8054	(83)
Total gains	1214.1886	1528.3299	1793.3846	2090.7006	2289.4519	2285.4537	2184.6538	1998.9352	1797.9738	1496.5974	1245.7149	1137.1438	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)													
tau	40.9374	41.0178	41.0968	41.4722	41.5432	41.8769	41.8769	41.9393	41.7477	41.5432	41.3998	41.2510	
alpha	3.7292	3.7345	3.7398	3.7648	3.7695	3.7918	3.7918	3.7960	3.7832	3.7695	3.7600	3.7501	
util living area	0.9891	0.9746	0.9447	0.8691	0.7365	0.5628	0.4218	0.4754	0.7097	0.9159	0.9786	0.9914	(86)
MIT	19.1429	19.4639	19.8865	20.3914	20.7537	20.9340	20.9828	20.9732	20.8415	20.3352	19.6410	19.0879	(87)
Th 2	20.1145	20.1161	20.1176	20.1249	20.1263	20.1327	20.1327	20.1338	20.1302	20.1263	20.1235	20.1206	(88)
util rest of house	0.9870	0.9698	0.9343	0.8454	0.6925	0.4977	0.3429	0.3927	0.6478	0.8952	0.9738	0.9897	(89)
MIT 2	17.9169	18.3252	18.8575	19.4799	19.8959	20.0842	20.1239	20.1192	20.0007	19.4265	18.5584	17.8508	(90)
Living area fraction										fLA = Living area / (4) =		0.0833	(91)
MIT	18.0191	18.4201	18.9433	19.5558	19.9674	20.1550	20.1955	20.1904	20.0707	19.5022	18.6486	17.9539	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0191	18.4201	18.9433	19.5558	19.9674	20.1550	20.1955	20.1904	20.0707	19.5022	18.6486	17.9539	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9796	0.9572	0.9167	0.8274	0.6838	0.4994	0.3487	0.3983	0.6432	0.8768	0.9624	0.9834	(94)
Useful gains	1189.3593	1462.9757	1644.0741	1729.9280	1565.4512	1141.4600	761.8232	796.1422	1156.4351	1312.2603	1198.8303	1118.3039	(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	3011.4506	2961.9666	2720.8092	2308.8817	1788.2982	1192.0243	771.5310	812.1444	1285.1869	1925.6236	2506.7072	2996.1511	(97)
Space heating kWh	1355.6359	1007.3219	801.0909	416.8466	165.7982	0.0000	0.0000	0.0000	0.0000	456.3423	941.6714	1397.1183	(98a)
Space heating requirement - total per year (kWh/year)												6541.8254	
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	1355.6359	1007.3219	801.0909	416.8466	165.7982	0.0000	0.0000	0.0000	0.0000	456.3423	941.6714	1397.1183	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6541.8254	
Space heating per m2											(98c) / (4) =	28.6922	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1355.6359	1007.3219	801.0909	416.8466	165.7982	0.0000	0.0000	0.0000	0.0000	456.3423	941.6714	1397.1183	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	1468.7279	1091.3563	867.9208	451.6215	179.6297	0.0000	0.0000	0.0000	0.0000	494.4120	1020.2290	1513.6710	(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	255.1087	225.4068	239.3093	210.4320	203.9119	183.6929	181.4298	188.7770	190.9690	212.9655	226.4067	252.3624	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2417	87.0057	86.5546	85.5628	83.5997	79.8000	79.8000	79.8000	79.8000	85.7237	86.9003	87.2937	(217)
Fuel for water heating, kWh/month	292.4161	259.0712	276.4835	245.9388	243.9145	230.1916	227.3556	236.5627	239.3096	248.4324	260.5361	289.0956	(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	41.5994	33.3725	30.0483	22.0147	17.0048	13.8930	15.5123	20.1635	26.1904	34.3632	38.8131	42.7555	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-74.8014	-103.5784	-146.1985	-161.1976	-171.0032	-158.3815	-156.1641	-148.6305	-135.1745	-116.6541	-81.4577	-64.8701	(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	-48.1911	-100.6294	-198.7383	-296.7729	-390.9017	-392.4344	-388.0625	-329.4791	-242.5386	-143.6347	-64.2282	-38.1879	(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	7087.5681 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3049.3077 (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)	335.7306 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-4151.9105 (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	6406.6960 (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	7087.5681	0.2100	1488.3893	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3049.3077	0.2100	640.3546	(264)
Space and water heating			2128.7439	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	335.7306	0.1443	48.4563	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1518.1116	0.1350	-204.9740	
PV Unit electricity exported	-2633.7988	0.1261	-331.9966	
Total			-536.9706	(269)
Total CO2, kg/year			1652.1589	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.2500	(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	7087.5681	1.1300	8008.9520	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3049.3077	1.1300	3445.7177	(278)
Space and water heating			11454.6697	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	335.7306	1.5338	514.9549	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1518.1116	1.4990	-2275.6980	
PV Unit electricity exported	-2633.7988	0.4627	-1218.6712	
Total			-3494.3692	(283)
Total Primary energy kWh/year			8605.3562	(286)
Target Primary Energy Rate (TPER)			37.7400	(287)

Full SAP Calculation Printout

Property Reference	House Type P	Issued on Date	05/10/2023
Assessment Reference	Plot 16	Prop Type Ref	
Property			

SAP Rating	84 B	DER	3.24	TER	8.98
Environmental	97 A	% DER < TER			63.92
CO_2 Emissions (t/year)	0.54	DFEE	36.46	TFEE	40.39
Compliance Check	See BREL	% DFEE < TFEE			9.73
% DPER < TPER	28.20	DPER	33.76	TPER	47.01

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	80.0000	(1b)	x 2.4000	(2b) =	192.0000	(1b) -
First floor	64.0000	(1c)	x 2.4000	(2c) =	153.6000	(1c) -
Second floor	40.0000	(1d)	x 2.4000	(2d) =	96.0000	(1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	184.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		441.6000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0226	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2226	(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) =	0.1892	(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	0.2413	0.2366	0.2318	0.2082	0.2034	0.1798	0.1798	0.1751	0.1892	0.2034	0.2129	0.2224	(22b)
Effective ac	0.5291	0.5280	0.5269	0.5217	0.5207	0.5162	0.5162	0.5153	0.5179	0.5207	0.5227	0.5247	(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	
Opening Type 1 (Uw = 1.20)			56.3300	1.1450	64.5000			(27)
Heatloss Floor 1			80.0000	0.1200	9.6000	110.0000	8800.0000	(28a)
External Wall 1	274.0000	56.3300	217.6700	0.1900	41.3573	190.0000	41357.3000	(29a)
External Roof 1	64.0000		64.0000	0.1500	9.6000	9.0000	576.0000	(30)
External Roof 2	16.0000		16.0000	0.1500	2.4000	9.0000	144.0000	(30)
Total net area of external elements Aum(A, m2)			434.0000					(31)

Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 127.4573 (33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 50877.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.5071 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E5 Ground floor (normal)	46.0000	0.0670	3.0820
	E6 Intermediate floor within a dwelling	66.0000	0.0020	0.1320
	E16 Corner (normal)	28.8000	0.0410	1.1808
	E2 Other lintels (including other steel lintels)	25.0000	0.0240	0.6000
	E3 Sill	20.0000	0.0190	0.3800
	E4 Jamb	60.0000	0.0140	0.8400
	E10 Eaves (insulation at ceiling level)	20.0000	0.0460	0.9200
	E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5308 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 134.9881 (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	77.1063	76.9415	76.7801	76.0216	75.8797	75.2192	75.2192	75.0969	75.4736	75.8797	76.1668	76.4669	(38)
Heat transfer coeff	212.0944	211.9296	211.7682	211.0097	210.8678	210.2073	210.2073	210.0850	210.4617	210.8678	211.1549	211.4550	(39)

Average = Sum(39)m / 12 = 211.0091

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1527	1.1518	1.1509	1.1468	1.1460	1.1424	1.1424	1.1418	1.1438	1.1460	1.1476	1.1492	(40)
HLP (average)												1.1468	
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 2.9811 (42)
Hot water usage for mixer showers

74.2024	73.0873	71.4623	68.3533	66.0589	63.5002	62.0459	63.6585	65.4263	68.1735	71.3493	73.9181	(42a)

Hot water usage for baths

32.0327	31.5569	30.8870	29.6518	28.7269	27.7013	27.1473	27.8125	28.5369	29.6343	30.8950	31.9244	(42b)

Hot water usage for other uses

45.1590	43.5169	41.8747	40.2326	38.5904	36.9483	36.9483	38.5904	40.2326	41.8747	43.5169	45.1590	(42c)

Average daily hot water use (litres/day) 139.1651 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.3941	148.1611	144.2241	138.2377	133.3762	128.1498	126.1414	130.0615	134.1957	139.6825	145.7612	151.0015	(44)
Energy conte	239.7712	210.9794	221.6670	189.2404	179.5500	157.5751	152.5571	161.0433	165.4767	189.5479	207.6635	236.4318	(45)

Energy content (annual) Total = Sum(45)m = 2311.5035
Distribution loss (46)m = 0.15 x (45)m

35.9657	31.6469	33.2501	28.3861	26.9325	23.6363	22.8836	24.1565	24.8215	28.4322	31.1495	35.4648	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

293.1656	259.2066	275.0614	240.9124	232.9444	209.2471	205.9515	214.4377	217.1487	242.9423	259.3355	289.8262	(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

293.1656	259.2066	275.0614	240.9124	232.9444	209.2471	205.9515	214.4377	217.1487	242.9423	259.3355	289.8262	(64)

Total per year (kWh/year) = Sum(64)m = 2940.1795 (64)
12Total per year (kWh/year) 2940 (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

122.4394	108.7324	116.4198	104.2600	102.4159	93.7313	93.4408	96.2624	96.3586	105.7402	110.3857	121.3291	(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	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	179.3457	198.5614	179.3457	185.3239	179.3457	185.3239	179.3457	179.3457	185.3239	179.3457	185.3239	179.3457	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	355.5730	359.2627	349.9647	330.1704	305.1835	281.6994	266.0106	262.3209	271.6189	291.4132	316.4001	339.8842	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	(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)													

	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	(71)
Water heating gains (Table 5)												
	164.5692	161.8042	156.4782	144.8056	137.6558	130.1824	125.5924	129.3850	133.8314	142.1239	153.3135	163.0768 (72)
Total internal gains												
	767.2038	787.3442	753.5046	728.0158	689.9009	664.9216	638.6646	638.7674	658.4901	680.5988	722.7534	750.0225 (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	10.6500	10.6334	0.7600	0.7000	0.7700	41.7509	(74)
East	19.0700	19.6403	0.7600	0.7000	0.7700	138.0838	(76)
South	21.8600	46.7521	0.7600	0.7000	0.7700	376.7869	(78)
West	4.7500	19.6403	0.7600	0.7000	0.7700	34.3942	(80)

Solar gains	591.0160	1034.2718	1477.2859	1916.5742	2212.3039	2221.6683	2131.6274	1909.4270	1630.3838	1160.9139	713.1861	502.2218	(83)
Total gains	1358.2197	1821.6160	2230.7904	2644.5899	2902.2048	2886.5899	2770.2920	2548.1945	2288.8739	1841.5127	1435.9394	1252.2444	(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	66.6335	66.6853	66.7361	66.9760	67.0210	67.2317	67.2317	67.2708	67.1504	67.0210	66.9299	66.8349	
alpha	5.4422	5.4457	5.4491	5.4651	5.4681	5.4821	5.4821	5.4847	5.4767	5.4681	5.4620	5.4557	
util living area													
	0.9966	0.9844	0.9450	0.8301	0.6478	0.4622	0.3333	0.3781	0.6142	0.9089	0.9896	0.9978	(86)
Living	19.8242	20.1301	20.4827	20.8075	20.9564	20.9941	20.9992	20.9984	20.9751	20.7207	20.1858	19.7619	
Non living	18.6005	18.9881	19.4215	19.7902	19.9328	19.9636	19.9661	19.9664	19.9516	19.7106	19.0643	18.5230	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	0	0	0	0	0	0	0	0	0	0	16	
16 / 9	0	28	31	0	0	0	0	0	0	0	22	15	
MIT	21.0000	20.5073	20.7070	20.8075	20.9564	20.9941	20.9992	20.9984	20.9751	20.7207	20.4447	20.6607	(87)
Th 2	19.9580	19.9588	19.9595	19.9628	19.9634	19.9663	19.9663	19.9669	19.9652	19.9634	19.9622	19.9608	(88)
util rest of house													
	0.9954	0.9792	0.9280	0.7881	0.5851	0.3894	0.2553	0.2938	0.5307	0.8733	0.9853	0.9970	(89)
MIT 2	19.9580	19.5303	19.7220	19.7902	19.9328	19.9636	19.9661	19.9664	19.9516	19.7106	19.4321	19.6538	(90)
Living area fraction										fLA = Living area / (4) =		0.1576	(91)
MIT	20.1223	19.6843	19.8773	19.9505	20.0941	20.1260	20.1289	20.1291	20.1129	19.8698	19.5917	19.8125	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1223	19.6843	19.8773	19.9505	20.0941	20.1260	20.1289	20.1291	20.1129	19.8698	19.5917	19.8125	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9957	0.9775	0.9264	0.7876	0.5933	0.4008	0.2676	0.3071	0.5430	0.8695	0.9832	0.9969	(94)
Useful gains	1352.3163	1780.5963	2066.6844	2082.8369	1721.8474	1156.8674	741.4139	782.5810	1242.9660	1601.1057	1411.8457	1248.3129	(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													
	3355.8120	3133.2321	2832.8765	2331.7713	1770.0464	1161.6035	741.8102	783.4227	1265.4892	1954.7011	2637.6884	3301.3357	(97)
Space heating kWh													
	1490.6007	908.9713	570.0469	179.2327	35.8601	0.0000	0.0000	0.0000	0.0000	263.0750	882.6067	1527.4490	(98a)
Space heating requirement - total per year (kWh/year)												5857.8424	
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													
	1490.6007	908.9713	570.0469	179.2327	35.8601	0.0000	0.0000	0.0000	0.0000	263.0750	882.6067	1527.4490	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5857.8424	
Space heating per m2											(98c) / (4) =	31.8361	(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 %)	317.7295	(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													
	1490.6007	908.9713	570.0469	179.2327	35.8601	0.0000	0.0000	0.0000	0.0000	263.0750	882.6067	1527.4490	(98)
Space heating efficiency (main heating system 1)													
	317.7295	317.7295	317.7295	317.7295	317.7295	0.0000	0.0000	0.0000	0.0000	317.7295	317.7295	317.7295	(210)
Space heating fuel (main heating system)													
	469.1414	286.0833	179.4126	56.4105	11.2863	0.0000	0.0000	0.0000	0.0000	82.7984	277.7855	480.7387	(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												
	293.1656	259.2066	275.0614	240.9124	232.9444	209.2471	205.9515	214.4377	217.1487	242.9423	259.3355	289.8262 (64)
Efficiency of water heater												166.8478 (216)
(217)m	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478 (217)
Fuel for water heating, kWh/month												
	175.7084	155.3551	164.8577	144.3905	139.6149	125.4120	123.4368	128.5229	130.1478	145.6071	155.4324	173.7070 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	49.2837	39.5373	35.5989	26.0813	20.1459	16.4594	18.3778	23.8882	31.0284	40.7109	45.9828	50.6535 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1843.6568 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	166.8478
Water heating fuel used	1762.1926 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	397.7481 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	4003.5975 (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	1843.6568	0.1577	290.8166	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1762.1926	0.1410	248.4081	(264)
Space and water heating			539.2248	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	397.7481	0.1443	57.4073	(268)
Total CO2, kg/year			596.6321	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.2400	(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	1843.6568	1.5839	2920.1286	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1762.1926	1.5212	2680.7216	(278)
Space and water heating			5600.8502	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	397.7481	1.5338	610.0793	(282)
Total Primary energy kWh/year			6210.9295	(286)
Dwelling Primary energy Rate (DPER)			33.7600	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	80.0000 (1b)	x	2.4000 (2b)	=	192.0000 (1b)	-
First floor	64.0000 (1c)	x	2.4000 (2c)	=	153.6000 (1c)	-
Second floor	40.0000 (1d)	x	2.4000 (2d)	=	96.0000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	184.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	441.6000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0906	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3406	(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) =	0.2895	(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	0.3691	0.3619	0.3546	0.3184	0.3112	0.2750	0.2750	0.2678	0.2895	0.3112	0.3257	0.3402	(22b)
Effective ac	0.5681	0.5655	0.5629	0.5507	0.5484	0.5378	0.5378	0.5359	0.5419	0.5484	0.5530	0.5579	(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 Opening Type (Uw = 1.20)			46.0000	1.1450	52.6718			(27)
Heatloss Floor 1			80.0000	0.1300	10.4000			(28a)
External Wall 1	274.0000	46.0000	228.0000	0.1800	41.0400			(29a)
External Roof 1	64.0000		64.0000	0.1100	7.0400			(30)
External Roof 2	16.0000		16.0000	0.1100	1.7600			(30)
Total net area of external elements Aum(A, m2)			434.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		112.9118			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							276.5071	(35)

List of Thermal Bridges

	Length	Psi-value	Total
E5 Ground floor (normal)	46.0000	0.1600	7.3600
E6 Intermediate floor within a dwelling	66.0000	0.0000	0.0000
E16 Corner (normal)	28.8000	0.0900	2.5920
E2 Other lintels (including other steel lintels)	25.0000	0.0500	1.2500
E3 Sill	20.0000	0.0500	1.0000
E4 Jamb	60.0000	0.0500	3.0000
E10 Eaves (insulation at ceiling level)	20.0000	0.0600	1.2000
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		17.1220	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	130.0338	(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	82.7908	82.4053	82.0275	80.2528	79.9208	78.3751	78.3751	78.0888	78.9704	79.9208	80.5925	81.2947	(38)
Heat transfer coeff	212.8245	212.4391	212.0612	210.2866	209.9545	208.4088	208.4088	208.1226	209.0042	209.9545	210.6262	211.3285	(39)
Average = Sum(39)m / 12 =												210.2850	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1567	1.1546	1.1525	1.1429	1.1411	1.1327	1.1327	1.1311	1.1359	1.1411	1.1447	1.1485	(40)
HLP (average)												1.1429	

Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9811	(42)
Hot water usage for mixer showers													
	74.2024	73.0873	71.4623	68.3533	66.0589	63.5002	62.0459	63.6585	65.4263	68.1735	71.3493	73.9181	(42a)
Hot water usage for baths													
	32.0327	31.5569	30.8870	29.6518	28.7269	27.7013	27.1473	27.8125	28.5369	29.6343	30.8950	31.9244	(42b)
Hot water usage for other uses													
	45.1590	43.5169	41.8747	40.2326	38.5904	36.9483	36.9483	38.5904	40.2326	41.8747	43.5169	45.1590	(42c)
Average daily hot water use (litres/day)												139.1651	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	151.3941	148.1611	144.2241	138.2377	133.3762	128.1498	126.1414	130.0615	134.1957	139.6825	145.7612	151.0015	(44)
Energy conte	239.7712	210.9794	221.6670	189.2404	179.5500	157.5751	152.5571	161.0433	165.4767	189.5479	207.6635	236.4318	(45)
Energy content (annual)										Total = Sum(45)m =		2311.5035	
Distribution loss (46)m = 0.15 x (45)m													
	35.9657	31.6469	33.2501	28.3861	26.9325	23.6363	22.8836	24.1565	24.8215	28.4322	31.1495	35.4648	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	286.3661	253.0651	268.2619	234.3323	226.1449	202.6669	199.1520	207.6382	210.5686	236.1428	252.7553	283.0267	(62)
WWHRS	-33.9222	-30.0011	-31.4154	-26.0132	-24.2434	-20.7452	-19.4453	-20.6782	-21.4638	-25.3035	-28.6658	-33.2940	(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													
	252.4439	223.0640	236.8465	208.3191	201.9015	181.9217	179.7067	186.9600	189.1047	210.8393	224.0896	249.7327	(64)
										Total per year (kWh/year) = Sum(64)m =		2544.9297	(64)
12Total per year (kWh/year)												2545	(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													
	116.9999	103.8192	110.9802	98.9959	96.9763	88.4672	88.0012	90.8228	91.0945	100.3006	105.1216	115.8895	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	179.3457	198.5614	179.3457	185.3239	179.3457	185.3239	179.3457	179.3457	185.3239	179.3457	185.3239	179.3457	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	355.5730	359.2627	349.9647	330.1704	305.1835	281.6994	266.0106	262.3209	271.6189	291.4132	316.4001	339.8842	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	(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)													
	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	(71)
Water heating gains (Table 5)													
	157.2579	154.4929	149.1669	137.4943	130.3445	122.8711	118.2811	122.0737	126.5201	134.8126	146.0022	155.7655	(72)
Total internal gains													
	762.8925	783.0329	749.1933	723.7045	685.5896	657.6103	631.3533	631.4561	651.1788	676.2875	718.4421	745.7113	(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	8.7000	10.6334	0.6300	0.7000	0.7700	28.2724	(74)
East	15.5700	19.6403	0.6300	0.7000	0.7700	93.4561	(76)
South	17.8500	46.7521	0.6300	0.7000	0.7700	255.0415	(78)
West	3.8800	19.6403	0.6300	0.7000	0.7700	23.2890	(80)

Solar gains	400.0590	700.1005	999.9825	1297.3494	1497.5430	1503.8871	1442.9346	1292.5155	1103.6185	785.8260	482.7563	339.9541	(83)
Total gains	1162.9515	1483.1334	1749.1757	2021.0539	2183.1326	2161.4974	2074.2879	1923.9717	1754.7973	1462.1134	1201.1983	1085.6654	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)													
tau	66.4049	66.5253	66.6439	67.2063	67.3126	67.8118	67.8118	67.9051	67.6187	67.3126	67.0979	66.8750	
alpha	5.4270	5.4350	5.4429	5.4804	5.4875	5.5208	5.5208	5.5270	5.5079	5.4875	5.4732	5.4583	
util living area	0.9984	0.9939	0.9795	0.9249	0.7950	0.5999	0.4393	0.4923	0.7529	0.9605	0.9955	0.9989	(86)
MIT	19.7151	19.9547	20.2684	20.6366	20.8832	20.9800	20.9969	20.9945	20.9349	20.5805	20.0682	19.6742	(87)
Th 2	19.9548	19.9565	19.9582	19.9660	19.9674	19.9743	19.9743	19.9755	19.9716	19.9674	19.9645	19.9614	(88)
util rest of house	0.9978	0.9917	0.9718	0.8986	0.7353	0.5115	0.3384	0.3855	0.6668	0.9410	0.9935	0.9985	(89)
MIT 2	18.4588	18.7657	19.1625	19.6132	19.8773	19.9642	19.9734	19.9739	19.9322	19.5592	18.9177	18.4113	(90)
Living area fraction										fLA = Living area / (4) =		0.1576	(91)
MIT	18.6568	18.9531	19.3368	19.7745	20.0358	20.1243	20.1347	20.1347	20.0902	19.7202	19.0990	18.6103	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6568	18.9531	19.3368	19.7745	20.0358	20.1243	20.1347	20.1347	20.0902	19.7202	19.0990	18.6103	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9967	0.9886	0.9658	0.8928	0.7396	0.5248	0.3544	0.4024	0.6776	0.9349	0.9910	0.9977	(94)
Useful gains	1159.1349	1466.2885	1689.4149	1804.4190	1614.6653	1134.4184	735.1050	774.1773	1189.1310	1366.8932	1190.3594	1083.1546	(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	3055.4871	2985.4269	2722.1895	2286.7556	1750.1394	1151.3139	736.6722	777.2778	1251.9821	1914.8229	2527.3140	3045.3123	(97)
Space heating kWh	1410.8860	1020.8610	768.3843	347.2823	100.7928	0.0000	0.0000	0.0000	0.0000	407.6597	962.6073	1459.8454	(98a)
Space heating requirement - total per year (kWh/year)												6478.3188	
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	1410.8860	1020.8610	768.3843	347.2823	100.7928	0.0000	0.0000	0.0000	0.0000	407.6597	962.6073	1459.8454	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6478.3188	
Space heating per m2											(98c) / (4) =	35.2083	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1410.8860	1020.8610	768.3843	347.2823	100.7928	0.0000	0.0000	0.0000	0.0000	407.6597	962.6073	1459.8454	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	1528.5872	1106.0249	832.4857	376.2539	109.2013	0.0000	0.0000	0.0000	0.0000	441.6681	1042.9115	1581.6309	(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	252.4439	223.0640	236.8465	208.3191	201.9015	181.9217	179.7067	186.9600	189.1047	210.8393	224.0896	249.7327	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.3056	87.0397	86.5014	85.1973	82.5872	79.8000	79.8000	79.8000	79.8000	85.5124	86.9483	87.3607	(217)
Fuel for water heating, kWh/month	289.1497	256.2786	273.8066	244.5138	244.4707	227.9721	225.1964	234.2857	236.9734	246.5600	257.7275	285.8638	(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	37.2645	29.8950	26.9171	19.7206	15.2328	12.4453	13.8958	18.0624	23.4612	30.7824	34.7686	38.3002	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-70.2264	-96.7363	-135.8497	-149.0243	-157.4900	-145.6856	-143.6720	-137.0445	-125.0999	-108.6140	-76.3051	-60.9660	(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	-46.9093	-97.7473	-192.6615	-287.1381	-377.6576	-378.9010	-374.6390	-318.2979	-234.6269	-139.2801	-62.4434	-37.1844	(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	7018.7636	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3022.7980	(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)	300.7459	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3954.2004	(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	6474.1071	(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	7018.7636	0.2100	1473.9404	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3022.7980	0.2100	634.7876	(264)
Space and water heating			2108.7279	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	300.7459	0.1443	43.4069	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1406.7138	0.1351	-190.0809	
PV Unit electricity exported	-2547.4866	0.1261	-321.2718	
Total			-511.3528	(269)
Total CO2, kg/year			1652.7114	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.9800	(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	7018.7636	1.1300	7931.2029	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3022.7980	1.1300	3415.7618	(278)
Space and water heating			11346.9647	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	300.7459	1.5338	461.2941	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1406.7138	1.4994	-2109.2632	
PV Unit electricity exported	-2547.4866	0.4629	-1179.3111	
Total			-3288.5742	(283)
Total Primary energy kWh/year			8649.7853	(286)
Target Primary Energy Rate (TPER)			47.0100	(287)

Full SAP Calculation Printout

Property Reference	House Type M	Issued on Date	05/10/2023
Assessment Reference	Plot 17	Prop Type Ref	
Property			

SAP Rating	82 B	DER	3.69	TER	9.35
Environmental	96 A	% DER < TER			60.53
CO_2 Emissions (t/year)	0.46	DFEE	36.85	TFEE	40.41
Compliance Check	See BREL	% DFEE < TFEE			8.82
% DPER < TPER	21.01	DPER	38.58	TPER	48.84

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	72.0000 (1b)	x	2.4000 (2b)	=	172.8000 (1b)	-
First floor	65.0000 (1c)	x	2.4000 (2c)	=	156.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	328.8000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0304	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2304	(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) =	0.1959	(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	0.2497	0.2448	0.2399	0.2154	0.2105	0.1861	0.1861	0.1812	0.1959	0.2105	0.2203	0.2301	(22b)
Effective ac	0.5312	0.5300	0.5288	0.5232	0.5222	0.5173	0.5173	0.5164	0.5192	0.5222	0.5243	0.5265	(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	
Opening Type 1 (Uw = 1.20)			40.0600	1.1450	45.8702			(27)
Heatloss Floor 1			72.0000	0.1200	8.6400	110.0000	7920.0000	(28a)
External Wall 1	180.0000	40.0600	139.9400	0.1900	26.5886	190.0000	26588.6000	(29a)
External Roof 1	65.0000		65.0000	0.1500	9.7500	9.0000	585.0000	(30)
External Roof 2	7.0000		7.0000	0.1500	1.0500	9.0000	63.0000	(30)
Total net area of external elements Aum(A, m2)			324.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	91.8988			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 35156.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 256.6175 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	40.0000	0.0670	2.6800
E6 Intermediate floor within a dwelling	35.0000	0.0020	0.0700
E16 Corner (normal)	19.2000	0.0410	0.7872
E2 Other lintels (including other steel lintels)	24.4000	0.0240	0.5856
E3 Sill	18.4000	0.0190	0.3496
E4 Jamb	63.6000	0.0140	0.8904
E10 Eaves (insulation at ceiling level)	23.0000	0.0460	1.0580
E12 Gable (insulation at ceiling level)	10.0000	0.0330	0.3300

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.7508 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 98.6496 (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	57.6349	57.5035	57.3748	56.7700	56.6568	56.1301	56.1301	56.0325	56.3330	56.6568	56.8858	57.1251	(38)
Heat transfer coeff	156.2845	156.1532	156.0244	155.4196	155.3065	154.7797	154.7797	154.6822	154.9826	155.3065	155.5354	155.7747	(39)

Average = Sum(39)m / 12 = 155.4191

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1408	1.1398	1.1389	1.1344	1.1336	1.1298	1.1298	1.1291	1.1313	1.1336	1.1353	1.1370	(40)
HLP (average)												1.1344	
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 2.9111 (42)

Hot water usage for mixer showers												
	73.0302	71.9327	70.3334	67.2735	65.0153	62.4970	61.0657	62.6528	64.3927	67.0965	70.2222	72.7503 (42a)
Hot water usage for baths												
	31.5286	31.0603	30.4009	29.1852	28.2748	27.2653	26.7201	27.3749	28.0878	29.1679	30.4088	31.4220 (42b)
Hot water usage for other uses												
	44.4430	42.8269	41.2108	39.5947	37.9786	36.3625	36.3625	37.9786	39.5947	41.2108	42.8269	44.4430 (42c)

Average daily hot water use (litres/day) 136.9661 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.0018	145.8199	141.9451	136.0533	131.2687	126.1249	124.1482	128.0063	132.0751	137.4753	143.4578	148.6154	(44)
Energy conte	235.9824	207.6456	218.1644	186.2502	176.7129	155.0852	150.1465	158.4985	162.8619	186.5526	204.3820	232.6957	(45)

Energy content (annual) Total = Sum(45)m = 2274.9779

Distribution loss (46)m = 0.15 x (45)m												
	35.3974	31.1468	32.7247	27.9375	26.5069	23.2628	22.5220	23.7748	24.4293	27.9829	30.6573	34.9044 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9720 (55)
Total storage loss												
	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (56)
If cylinder contains dedicated solar storage												
	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	289.3768	255.8728	271.5588	237.9222	230.1073	206.7572	203.5409	211.8929	214.5339	239.9470	256.0540	286.0901 (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												
	289.3768	255.8728	271.5588	237.9222	230.1073	206.7572	203.5409	211.8929	214.5339	239.9470	256.0540	286.0901 (64)

Total per year (kWh/year) = Sum(64)m = 2903.6539 (64)
12Total per year (kWh/year) 2904 (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												
	121.1797	107.6239	115.2552	103.2658	101.4726	92.9034	92.6392	95.4163	95.4892	104.7443	109.2946	120.0869 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	154.3290	170.8642	154.3290	159.4733	154.3290	159.4733	154.3290	154.3290	159.4733	154.3290	159.4733	154.3290	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	305.9745	309.1495	301.1485	284.1152	262.6138	242.4054	228.9050	225.7300	233.7310	250.7643	272.2657	292.4741	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	(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)													
	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	(71)

Water heating gains (Table 5)

	162.8759	160.1546	154.9129	143.4247	136.3878	129.0326	124.5151	128.2477	132.6238	140.7853	151.7981	161.4071 (72)

Total internal gains

	689.8465	706.8356	677.0575	653.6803	619.9977	597.5784	574.4163	574.9738	592.4953	612.5457	650.2042	674.8773 (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	1.7600	10.6334	0.7600	0.7000	0.7700	6.8997 (74)
East	15.8000	19.6403	0.7600	0.7000	0.7700	114.4061 (76)
South	5.6000	46.7521	0.7600	0.7000	0.7700	96.5236 (78)
West	16.9000	19.6403	0.7600	0.7000	0.7700	122.3711 (80)

Solar gains	340.2006	634.4530	986.5748	1376.0791	1649.0543	1675.8306	1600.2139	1396.3910	1124.4609	735.8106	418.1585	283.8713 (83)
Total gains	1030.0470	1341.2885	1663.6323	2029.7594	2269.0520	2273.4090	2174.6302	1971.3648	1716.9562	1348.3564	1068.3627	958.7486 (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	62.4868	62.5394	62.5910	62.8345	62.8803	63.0943	63.0943	63.1341	63.0117	62.8803	62.7878	62.6913	
alpha	5.1658	5.1693	5.1727	5.1890	5.1920	5.2063	5.2063	5.2089	5.2008	5.1920	5.1859	5.1794	
util living area	0.9950	0.9815	0.9365	0.8048	0.6129	0.4325	0.3127	0.3598	0.6017	0.9039	0.9868	0.9965	(86)
Living	19.7832	20.0805	20.4591	20.8102	20.9588	20.9943	20.9991	20.9983	20.9721	20.6953	20.1488	19.7235	
Non living	18.5635	18.9396	19.4041	19.8014	19.9439	19.9738	19.9764	19.9766	19.9595	19.6931	19.0321	18.4897	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	10	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	21	28	2	0	0	0	0	0	0	0	0	31	
MIT	20.5331	20.4792	20.4742	20.8102	20.9588	20.9943	20.9991	20.9983	20.9721	20.6953	20.1488	20.2771	(87)
Th 2	19.9677	19.9685	19.9692	19.9728	19.9735	19.9766	19.9766	19.9772	19.9754	19.9735	19.9721	19.9707	(88)
util rest of house	0.9934	0.9757	0.9185	0.7622	0.5531	0.3648	0.2402	0.2804	0.5210	0.8688	0.9817	0.9953	(89)
MIT 2	19.5478	19.5143	19.4245	19.8014	19.9439	19.9738	19.9764	19.9766	19.9595	19.6931	19.0321	19.3170	(90)
Living area fraction									fLA = Living area / (4) =			0.1241	(91)
MIT	19.6701	19.6341	19.5548	19.9266	20.0698	20.1004	20.1033	20.1034	20.0851	19.8175	19.1707	19.4361	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6701	19.6341	19.5548	19.9266	20.0698	20.1004	20.1033	20.1034	20.0851	19.8175	19.1707	19.4361	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9928	0.9734	0.9098	0.7602	0.5589	0.3731	0.2492	0.2903	0.5299	0.8625	0.9761	0.9945	(94)
Useful gains	1022.5938	1305.6351	1513.6363	1542.9510	1268.0968	848.1450	541.9404	572.2011	909.8574	1162.9740	1042.8411	953.5051	(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	2402.1098	2300.7704	2036.8616	1713.7514	1299.8896	851.3549	542.2351	572.8518	927.5921	1431.5305	1877.4182	2373.4063	(97)
Space heating kWh	1026.3599	668.7309	389.2797	122.9763	23.6539	0.0000	0.0000	0.0000	0.0000	199.8060	600.8955	1056.4065	(98a)
Space heating requirement - total per year (kWh/year)												4088.1087	
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	1026.3599	668.7309	389.2797	122.9763	23.6539	0.0000	0.0000	0.0000	0.0000	199.8060	600.8955	1056.4065	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4088.1087	
Space heating per m2										(98c) / (4) =		29.8402	(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 %) 300.9991 (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	1026.3599	668.7309	389.2797	122.9763	23.6539	0.0000	0.0000	0.0000	0.0000	199.8060	600.8955	1056.4065	(98)
Space heating efficiency (main heating system 1)	300.9991	300.9991	300.9991	300.9991	300.9991	0.0000	0.0000	0.0000	0.0000	300.9991	300.9991	300.9991	(210)
Space heating fuel (main heating system)	340.9844	222.1704	129.3292	40.8560	7.8585	0.0000	0.0000	0.0000	0.0000	66.3809	199.6337	350.9667	(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

289.3768	255.8728	271.5588	237.9222	230.1073	206.7572	203.5409	211.8929	214.5339	239.9470	256.0540	286.0901 (64)

Efficiency of water heater 168.9051 (216)

(217)m 168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051 (217)

Fuel for water heating, kWh/month

171.3250	151.4891	160.7759	140.8614	136.2346	122.4103	120.5061	125.4508	127.0144	142.0602	151.5963	169.3792 (219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting 41.9363	33.6429	30.2917	22.1930	17.1425	14.0056	15.6380	20.3268	26.4025	34.6415	39.1275	43.1019 (232)

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

(233a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

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

(233b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	1358.1799 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	168.9051
Water heating fuel used	1719.1034 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	338.4501 (232)

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

PV generation	0.0000 (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	3415.7334 (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	1358.1799	0.1577	214.1749	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1719.1034	0.1410	242.3208	(264)
Space and water heating			456.4957	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	338.4501	0.1443	48.8488	(268)
Total CO2, kg/year			505.3445	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6900	(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	1358.1799	1.5837	2150.9748	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1719.1034	1.5212	2615.1228	(278)
Space and water heating			4766.0976	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	338.4501	1.5338	519.1261	(282)
Total Primary energy kWh/year			5285.2237	(286)
Dwelling Primary energy Rate (DPER)			38.5800	(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	72.0000 (1b)	x	2.4000 (2b)	=	172.8000 (1b)	-
First floor	65.0000 (1c)	x	2.4000 (2c)	=	156.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	328.8000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1217	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3717	(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) =	0.3159	(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	0.4028	0.3949	0.3870	0.3475	0.3396	0.3001	0.3001	0.2922	0.3159	0.3396	0.3554	0.3712	(22b)
Effective ac	0.5811	0.5780	0.5749	0.5604	0.5577	0.5450	0.5450	0.5427	0.5499	0.5577	0.5632	0.5689	(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 Opening Type (Uw = 1.20)			34.2500	1.1450	39.2176			(27)
Heatloss Floor 1			72.0000	0.1300	9.3600			(28a)
External Wall 1	180.0000	34.2500	145.7500	0.1800	26.2350			(29a)
External Roof 1	65.0000		65.0000	0.1100	7.1500			(30)
External Roof 2	7.0000		7.0000	0.1100	0.7700			(30)
Total net area of external elements Aum(A, m2)			324.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		82.7326			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 256.6175 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	40.0000	0.1600	6.4000
E6 Intermediate floor within a dwelling	35.0000	0.0000	0.0000
E16 Corner (normal)	19.2000	0.0900	1.7280
E2 Other lintels (including other steel lintels)	24.4000	0.0500	1.2200
E3 Sill	18.4000	0.0500	0.9200
E4 Jamb	63.6000	0.0500	3.1800
E10 Eaves (insulation at ceiling level)	23.0000	0.0600	1.3800
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.4280	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	98.1606	(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	63.0534	62.7117	62.3766	60.8032	60.5088	59.1383	59.1383	58.8845	59.6662	60.5088	61.1043	61.7269	(38)
Heat transfer coeff	161.2140	160.8722	160.5372	158.9637	158.6693	157.2989	157.2989	157.0451	157.8267	158.6693	159.2649	159.8875	(39)
Average = Sum(39)m / 12 =												158.9623	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1767	1.1742	1.1718	1.1603	1.1582	1.1482	1.1482	1.1463	1.1520	1.1582	1.1625	1.1671	(40)
HLP (average)												1.1603	
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 2.9111 (42)

Hot water usage for mixer showers

	73.0302	71.9327	70.3334	67.2735	65.0153	62.4970	61.0657	62.6528	64.3927	67.0965	70.2222	72.7503 (42a)

Hot water usage for baths

	31.5286	31.0603	30.4009	29.1852	28.2748	27.2653	26.7201	27.3749	28.0878	29.1679	30.4088	31.4220 (42b)

Hot water usage for other uses

	44.4430	42.8269	41.2108	39.5947	37.9786	36.3625	36.3625	37.9786	39.5947	41.2108	42.8269	44.4430 (42c)

Average daily hot water use (litres/day) 136.9661 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	149.0018	145.8199	141.9451	136.0533	131.2687	126.1249	124.1482	128.0063	132.0751	137.4753	143.4578	148.6154	(44)
Energy conte	235.9824	207.6456	218.1644	186.2502	176.7129	155.0852	150.1465	158.4985	162.8619	186.5526	204.3820	232.6957	(45)
Energy content (annual)										Total = Sum(45)m =		2274.9779	
Distribution loss (46)m = 0.15 x (45)m													
	35.3974	31.1468	32.7247	27.9375	26.5069	23.2628	22.5220	23.7748	24.4293	27.9829	30.6573	34.9044	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	282.5773	249.7313	264.7593	231.3420	223.3078	200.1771	196.7414	205.0934	207.9537	233.1475	249.4738	279.2906	(62)
WWHRS	-33.3863	-29.5271	-30.9191	-25.6023	-23.8604	-20.4175	-19.1382	-20.3515	-21.1247	-24.9037	-28.2129	-32.7681	(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													
	249.1909	220.2042	233.8402	205.7398	199.4474	179.7596	177.6033	184.7419	186.8290	208.2438	221.2609	246.5226	(64)
										Total per year (kWh/year) = Sum(64)m =		2513.3834	(64)
12Total per year (kWh/year)												2513	(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													
	115.7401	102.7107	109.8156	98.0017	96.0330	87.6393	87.1996	89.9767	90.2250	99.3047	104.0305	114.6473	(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	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	154.3290	170.8642	154.3290	159.4733	154.3290	159.4733	154.3290	154.3290	159.4733	154.3290	159.4733	154.3290	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	305.9745	309.1495	301.1485	284.1152	262.6138	242.4054	228.9050	225.7300	233.7310	250.7643	272.2657	292.4741	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	(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)													
	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	(71)
Water heating gains (Table 5)													
	155.5646	152.8434	147.6016	136.1134	129.0766	121.7213	117.2038	120.9364	125.3126	133.4740	144.4868	154.0958	(72)
Total internal gains													
	685.5352	702.5243	672.7462	649.3691	615.6865	590.2671	567.1050	567.6625	585.1840	608.2344	645.8930	670.5660	(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	1.5000	10.6334	0.6300	0.7000	0.7700	4.8746	(74)
East	13.5100	19.6403	0.6300	0.7000	0.7700	81.0913	(76)
South	4.7900	46.7521	0.6300	0.7000	0.7700	68.4397	(78)
West	14.4500	19.6403	0.6300	0.7000	0.7700	86.7335	(80)

Solar gains	241.1391	449.7032	699.2729	975.3244	1168.7797	1187.7483	1134.1586	989.7127	796.9968	521.5417	296.3957	201.2129	(83)
Total gains	926.6743	1152.2274	1372.0191	1624.6934	1784.4661	1778.0154	1701.2636	1557.3752	1382.1808	1129.7761	942.2886	871.7789	(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	60.5762	60.7048	60.8315	61.4337	61.5476	62.0839	62.0839	62.1842	61.8762	61.5476	61.3175	61.0787	
alpha	5.0384	5.0470	5.0554	5.0956	5.1032	5.1389	5.1389	5.1456	5.1251	5.1032	5.0878	5.0719	
util living area													
	0.9970	0.9906	0.9704	0.8977	0.7479	0.5526	0.4044	0.4590	0.7237	0.9494	0.9925	0.9978	(86)
MIT	19.6511	19.8945	20.2393	20.6443	20.8920	20.9814	20.9969	20.9942	20.9321	20.5580	20.0223	19.6122	(87)
Th 2	19.9386	19.9407	19.9426	19.9519	19.9536	19.9617	19.9617	19.9632	19.9586	19.9536	19.9501	19.9464	(88)
util rest of house													
	0.9959	0.9875	0.9606	0.8668	0.6864	0.4689	0.3103	0.3581	0.6381	0.9268	0.9895	0.9970	(89)
MIT 2	18.3743	18.6855	19.1196	19.6097	19.8705	19.9521	19.9608	19.9614	19.9167	19.5244	18.8568	18.3301	(90)
Living area fraction										fLA = Living area / (4) =		0.1241	(91)
MIT	18.5327	18.8355	19.2585	19.7381	19.9972	20.0799	20.0894	20.0895	20.0427	19.6527	19.0014	18.4892	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5327	18.8355	19.2585	19.7381	19.9972	20.0799	20.0894	20.0895	20.0427	19.6527	19.0014	18.4892	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9938	0.9828	0.9522	0.8595	0.6892	0.4787	0.3220	0.3706	0.6456	0.9185	0.9854	0.9953	(94)
Useful gains	920.9178	1132.4064	1306.4790	1396.3497	1229.8438	851.0951	547.7624	577.1717	892.3538	1037.6847	928.5633	867.6978	(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													
	2294.5096	2241.8320	2048.2200	1722.8661	1316.5150	861.9774	548.8741	579.4229	937.9114	1436.3817	1895.4747	2284.6644	(97)
Space heating kWh													
	1021.9522	745.5340	551.8553	235.0918	64.4833	0.0000	0.0000	0.0000	0.0000	296.6306	696.1762	1054.2231	(98a)
Space heating requirement - total per year (kWh/year)												4665.9466	
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													
	1021.9522	745.5340	551.8553	235.0918	64.4833	0.0000	0.0000	0.0000	0.0000	296.6306	696.1762	1054.2231	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4665.9466	
Space heating per m2											(98c) / (4) =	34.0580	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1021.9522	745.5340	551.8553	235.0918	64.4833	0.0000	0.0000	0.0000	0.0000	296.6306	696.1762	1054.2231	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	1107.2072	807.7291	597.8931	254.7040	69.8628	0.0000	0.0000	0.0000	0.0000	321.3766	754.2537	1142.1702	(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													
	249.1909	220.2042	233.8402	205.7398	199.4474	179.7596	177.6033	184.7419	186.8290	208.2438	221.2609	246.5226	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.8792	86.5737	85.9161	84.3596	81.8262	79.8000	79.8000	79.8000	79.8000	84.8528	86.4486	86.9416	(217)
Fuel for water heating, kWh/month													
	286.8248	254.3547	272.1727	243.8842	243.7452	225.2626	222.5605	231.5061	234.1215	245.4178	255.9451	283.5495	(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	32.0665	25.7249	23.1625	16.9698	13.1080	10.7093	11.9575	15.5429	20.1886	26.4886	29.9188	32.9577	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-62.6048	-85.9383	-120.2897	-131.5376	-138.7083	-128.2528	-126.5228	-120.8547	-110.5579	-96.3364	-67.9345	-54.3895	(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	-42.8174	-89.0969	-175.3704	-261.0085	-342.9245	-343.8751	-339.9571	-288.9535	-213.1962	-126.7683	-56.9391	-33.9458	(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												5055.1967	(211)

Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2999.3447 (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)	258.7951 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3558.7804 (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	4840.5561 (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	5055.1967	0.2100	1061.5913	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2999.3447	0.2100	629.8624	(264)
Space and water heating			1691.4537	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	258.7951	0.1443	37.3521	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1243.9274	0.1352	-168.1619	
PV Unit electricity exported	-2314.8530	0.1262	-292.0372	
Total			-460.1991	(269)
Total CO2, kg/year			1280.5360	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3500	(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	5055.1967	1.1300	5712.3723	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2999.3447	1.1300	3389.2595	(278)
Space and water heating			9101.6317	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	258.7951	1.5338	396.9486	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1243.9274	1.4997	-1865.4670	
PV Unit electricity exported	-2314.8530	0.4631	-1072.0031	
Total			-2937.4701	(283)
Total Primary energy kWh/year			6691.2111	(286)
Target Primary Energy Rate (TPER)			48.8400	(287)

Full SAP Calculation Printout

Property Reference	House Type M	Issued on Date	05/10/2023
Assessment Reference	Plot 18	Prop Type Ref	
Property			

SAP Rating	82 B	DER	3.69	TER	9.35
Environmental	96 A	% DER < TER			60.53
CO_2 Emissions (t/year)	0.46	DFEE	36.85	TFEE	40.41
Compliance Check	See BREL	% DFEE < TFEE			8.82
% DPER < TPER	21.01	DPER	38.58	TPER	48.84

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	72.0000 (1b)	x	2.4000 (2b)	=	172.8000 (1b)	-
First floor	65.0000 (1c)	x	2.4000 (2c)	=	156.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	328.8000	(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	1 * 10	=	10.0000 (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) =	10.0000 / (5)	=	0.0304 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			4.0000 (17)
Infiltration rate			0.2304 (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)	=	0.1959 (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	0.2497	0.2448	0.2399	0.2154	0.2105	0.1861	0.1861	0.1812	0.1959	0.2105	0.2203	0.2301	(22b)
Effective ac	0.5312	0.5300	0.5288	0.5232	0.5222	0.5173	0.5173	0.5164	0.5192	0.5222	0.5243	0.5265	(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	
Opening Type 1 (Uw = 1.20)			40.0600	1.1450	45.8702			(27)
Heatloss Floor 1			72.0000	0.1200	8.6400	110.0000	7920.0000	(28a)
External Wall 1	180.0000	40.0600	139.9400	0.1900	26.5886	190.0000	26588.6000	(29a)
External Roof 1	65.0000		65.0000	0.1500	9.7500	9.0000	585.0000	(30)
External Roof 2	7.0000		7.0000	0.1500	1.0500	9.0000	63.0000	(30)
Total net area of external elements Aum(A, m2)			324.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	91.8988			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 35156.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 256.6175 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	40.0000	0.0670	2.6800
E6 Intermediate floor within a dwelling	35.0000	0.0020	0.0700
E16 Corner (normal)	19.2000	0.0410	0.7872
E2 Other lintels (including other steel lintels)	24.4000	0.0240	0.5856
E3 Sill	18.4000	0.0190	0.3496
E4 Jamb	63.6000	0.0140	0.8904
E10 Eaves (insulation at ceiling level)	23.0000	0.0460	1.0580
E12 Gable (insulation at ceiling level)	10.0000	0.0330	0.3300

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.7508 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 98.6496 (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	57.6349	57.5035	57.3748	56.7700	56.6568	56.1301	56.1301	56.0325	56.3330	56.6568	56.8858	57.1251	(38)
Heat transfer coeff	156.2845	156.1532	156.0244	155.4196	155.3065	154.7797	154.7797	154.6822	154.9826	155.3065	155.5354	155.7747	(39)

Average = Sum(39)m / 12 = 155.4191

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1408	1.1398	1.1389	1.1344	1.1336	1.1298	1.1298	1.1291	1.1313	1.1336	1.1353	1.1370	(40)
HLP (average)												1.1344	
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 2.9111 (42)

Hot water usage for mixer showers												
	73.0302	71.9327	70.3334	67.2735	65.0153	62.4970	61.0657	62.6528	64.3927	67.0965	70.2222	72.7503 (42a)
Hot water usage for baths												
	31.5286	31.0603	30.4009	29.1852	28.2748	27.2653	26.7201	27.3749	28.0878	29.1679	30.4088	31.4220 (42b)
Hot water usage for other uses												
	44.4430	42.8269	41.2108	39.5947	37.9786	36.3625	36.3625	37.9786	39.5947	41.2108	42.8269	44.4430 (42c)

Average daily hot water use (litres/day) 136.9661 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.0018	145.8199	141.9451	136.0533	131.2687	126.1249	124.1482	128.0063	132.0751	137.4753	143.4578	148.6154	(44)
Energy conte	235.9824	207.6456	218.1644	186.2502	176.7129	155.0852	150.1465	158.4985	162.8619	186.5526	204.3820	232.6957	(45)

Energy content (annual) Total = Sum(45)m = 2274.9779

Distribution loss (46)m = 0.15 x (45)m												
	35.3974	31.1468	32.7247	27.9375	26.5069	23.2628	22.5220	23.7748	24.4293	27.9829	30.6573	34.9044 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9720 (55)
Total storage loss												
	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (56)
If cylinder contains dedicated solar storage												
	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	289.3768	255.8728	271.5588	237.9222	230.1073	206.7572	203.5409	211.8929	214.5339	239.9470	256.0540	286.0901 (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												
	289.3768	255.8728	271.5588	237.9222	230.1073	206.7572	203.5409	211.8929	214.5339	239.9470	256.0540	286.0901 (64)

Total per year (kWh/year) = Sum(64)m = 2903.6539 (64)
12Total per year (kWh/year) 2904 (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												
	121.1797	107.6239	115.2552	103.2658	101.4726	92.9034	92.6392	95.4163	95.4892	104.7443	109.2946	120.0869 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	154.3290	170.8642	154.3290	159.4733	154.3290	159.4733	154.3290	154.3290	159.4733	154.3290	159.4733	154.3290	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	305.9745	309.1495	301.1485	284.1152	262.6138	242.4054	228.9050	225.7300	233.7310	250.7643	272.2657	292.4741	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	(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)													
	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	(71)

Water heating gains (Table 5)

	162.8759	160.1546	154.9129	143.4247	136.3878	129.0326	124.5151	128.2477	132.6238	140.7853	151.7981	161.4071 (72)

Total internal gains

	689.8465	706.8356	677.0575	653.6803	619.9977	597.5784	574.4163	574.9738	592.4953	612.5457	650.2042	674.8773 (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	1.7600	10.6334	0.7600	0.7000	0.7700	6.8997 (74)
East	15.8000	19.6403	0.7600	0.7000	0.7700	114.4061 (76)
South	5.6000	46.7521	0.7600	0.7000	0.7700	96.5236 (78)
West	16.9000	19.6403	0.7600	0.7000	0.7700	122.3711 (80)

Solar gains	340.2006	634.4530	986.5748	1376.0791	1649.0543	1675.8306	1600.2139	1396.3910	1124.4609	735.8106	418.1585	283.8713 (83)
Total gains	1030.0470	1341.2885	1663.6323	2029.7594	2269.0520	2273.4090	2174.6302	1971.3648	1716.9562	1348.3564	1068.3627	958.7486 (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	62.4868	62.5394	62.5910	62.8345	62.8803	63.0943	63.0943	63.1341	63.0117	62.8803	62.7878	62.6913	
alpha	5.1658	5.1693	5.1727	5.1890	5.1920	5.2063	5.2063	5.2089	5.2008	5.1920	5.1859	5.1794	
util living area	0.9950	0.9815	0.9365	0.8048	0.6129	0.4325	0.3127	0.3598	0.6017	0.9039	0.9868	0.9965	(86)
Living	19.7832	20.0805	20.4591	20.8102	20.9588	20.9943	20.9991	20.9983	20.9721	20.6953	20.1488	19.7235	
Non living	18.5635	18.9396	19.4041	19.8014	19.9439	19.9738	19.9764	19.9766	19.9595	19.6931	19.0321	18.4897	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	10	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	21	28	2	0	0	0	0	0	0	0	0	31	
MIT	20.5331	20.4792	20.4742	20.8102	20.9588	20.9943	20.9991	20.9983	20.9721	20.6953	20.1488	20.2771	(87)
Th 2	19.9677	19.9685	19.9692	19.9728	19.9735	19.9766	19.9766	19.9772	19.9754	19.9735	19.9721	19.9707	(88)
util rest of house	0.9934	0.9757	0.9185	0.7622	0.5531	0.3648	0.2402	0.2804	0.5210	0.8688	0.9817	0.9953	(89)
MIT 2	19.5478	19.5143	19.4245	19.8014	19.9439	19.9738	19.9764	19.9766	19.9595	19.6931	19.0321	19.3170	(90)
Living area fraction									fLA = Living area / (4) =			0.1241	(91)
MIT	19.6701	19.6341	19.5548	19.9266	20.0698	20.1004	20.1033	20.1034	20.0851	19.8175	19.1707	19.4361	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6701	19.6341	19.5548	19.9266	20.0698	20.1004	20.1033	20.1034	20.0851	19.8175	19.1707	19.4361	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9928	0.9734	0.9098	0.7602	0.5589	0.3731	0.2492	0.2903	0.5299	0.8625	0.9761	0.9945	(94)
Useful gains	1022.5938	1305.6351	1513.6363	1542.9510	1268.0968	848.1450	541.9404	572.2011	909.8574	1162.9740	1042.8411	953.5051	(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	2402.1098	2300.7704	2036.8616	1713.7514	1299.8896	851.3549	542.2351	572.8518	927.5921	1431.5305	1877.4182	2373.4063	(97)
Space heating kWh	1026.3599	668.7309	389.2797	122.9763	23.6539	0.0000	0.0000	0.0000	0.0000	199.8060	600.8955	1056.4065	(98a)
Space heating requirement - total per year (kWh/year)												4088.1087	
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	1026.3599	668.7309	389.2797	122.9763	23.6539	0.0000	0.0000	0.0000	0.0000	199.8060	600.8955	1056.4065	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4088.1087	
Space heating per m2										(98c) / (4) =		29.8402	(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 %) 300.9991 (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	1026.3599	668.7309	389.2797	122.9763	23.6539	0.0000	0.0000	0.0000	0.0000	199.8060	600.8955	1056.4065	(98)
Space heating efficiency (main heating system 1)	300.9991	300.9991	300.9991	300.9991	300.9991	0.0000	0.0000	0.0000	0.0000	300.9991	300.9991	300.9991	(210)
Space heating fuel (main heating system)	340.9844	222.1704	129.3292	40.8560	7.8585	0.0000	0.0000	0.0000	0.0000	66.3809	199.6337	350.9667	(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

289.3768	255.8728	271.5588	237.9222	230.1073	206.7572	203.5409	211.8929	214.5339	239.9470	256.0540	286.0901 (64)

Efficiency of water heater 168.9051 (216)

(217)m 168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051	168.9051 (217)

Fuel for water heating, kWh/month

171.3250	151.4891	160.7759	140.8614	136.2346	122.4103	120.5061	125.4508	127.0144	142.0602	151.5963	169.3792 (219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting 41.9363	33.6429	30.2917	22.1930	17.1425	14.0056	15.6380	20.3268	26.4025	34.6415	39.1275	43.1019 (232)

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

(233a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

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

(233b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	1358.1799 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	168.9051
Water heating fuel used	1719.1034 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	338.4501 (232)

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

PV generation	0.0000 (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	3415.7334 (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	1358.1799	0.1577	214.1749	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1719.1034	0.1410	242.3208	(264)
Space and water heating			456.4957	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	338.4501	0.1443	48.8488	(268)
Total CO2, kg/year			505.3445	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6900	(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	1358.1799	1.5837	2150.9748	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1719.1034	1.5212	2615.1228	(278)
Space and water heating			4766.0976	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	338.4501	1.5338	519.1261	(282)
Total Primary energy kWh/year			5285.2237	(286)
Dwelling Primary energy Rate (DPER)			38.5800	(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	72.0000 (1b)	x	2.4000 (2b)	=	172.8000 (1b)	-
First floor	65.0000 (1c)	x	2.4000 (2c)	=	156.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	137.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	328.8000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1217	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3717	(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) =	0.3159	(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	0.4028	0.3949	0.3870	0.3475	0.3396	0.3001	0.3001	0.2922	0.3159	0.3396	0.3554	0.3712	(22b)
Effective ac	0.5811	0.5780	0.5749	0.5604	0.5577	0.5450	0.5450	0.5427	0.5499	0.5577	0.5632	0.5689	(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 Opening Type (Uw = 1.20)			34.2500	1.1450	39.2176			(27)
Heatloss Floor 1			72.0000	0.1300	9.3600			(28a)
External Wall 1	180.0000	34.2500	145.7500	0.1800	26.2350			(29a)
External Roof 1	65.0000		65.0000	0.1100	7.1500			(30)
External Roof 2	7.0000		7.0000	0.1100	0.7700			(30)
Total net area of external elements Aum(A, m2)			324.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		82.7326			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 256.6175 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	40.0000	0.1600	6.4000
E6 Intermediate floor within a dwelling	35.0000	0.0000	0.0000
E16 Corner (normal)	19.2000	0.0900	1.7280
E2 Other lintels (including other steel lintels)	24.4000	0.0500	1.2200
E3 Sill	18.4000	0.0500	0.9200
E4 Jamb	63.6000	0.0500	3.1800
E10 Eaves (insulation at ceiling level)	23.0000	0.0600	1.3800
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		15.4280	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	98.1606	(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	63.0534	62.7117	62.3766	60.8032	60.5088	59.1383	59.1383	58.8845	59.6662	60.5088	61.1043	61.7269	(38)
Heat transfer coeff	161.2140	160.8722	160.5372	158.9637	158.6693	157.2989	157.2989	157.0451	157.8267	158.6693	159.2649	159.8875	(39)
Average = Sum(39)m / 12 =												158.9623	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1767	1.1742	1.1718	1.1603	1.1582	1.1482	1.1482	1.1463	1.1520	1.1582	1.1625	1.1671	(40)
HLP (average)												1.1603	
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 2.9111 (42)

Hot water usage for mixer showers

	73.0302	71.9327	70.3334	67.2735	65.0153	62.4970	61.0657	62.6528	64.3927	67.0965	70.2222	72.7503 (42a)

Hot water usage for baths

	31.5286	31.0603	30.4009	29.1852	28.2748	27.2653	26.7201	27.3749	28.0878	29.1679	30.4088	31.4220 (42b)

Hot water usage for other uses

	44.4430	42.8269	41.2108	39.5947	37.9786	36.3625	36.3625	37.9786	39.5947	41.2108	42.8269	44.4430 (42c)

Average daily hot water use (litres/day) 136.9661 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	149.0018	145.8199	141.9451	136.0533	131.2687	126.1249	124.1482	128.0063	132.0751	137.4753	143.4578	148.6154	(44)
Energy conte	235.9824	207.6456	218.1644	186.2502	176.7129	155.0852	150.1465	158.4985	162.8619	186.5526	204.3820	232.6957	(45)
Energy content (annual)										Total = Sum(45)m =		2274.9779	
Distribution loss (46)m = 0.15 x (45)m													
	35.3974	31.1468	32.7247	27.9375	26.5069	23.2628	22.5220	23.7748	24.4293	27.9829	30.6573	34.9044	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	282.5773	249.7313	264.7593	231.3420	223.3078	200.1771	196.7414	205.0934	207.9537	233.1475	249.4738	279.2906	(62)
WWHRS	-33.3863	-29.5271	-30.9191	-25.6023	-23.8604	-20.4175	-19.1382	-20.3515	-21.1247	-24.9037	-28.2129	-32.7681	(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													
	249.1909	220.2042	233.8402	205.7398	199.4474	179.7596	177.6033	184.7419	186.8290	208.2438	221.2609	246.5226	(64)
										Total per year (kWh/year) = Sum(64)m =		2513.3834	(64)
12Total per year (kWh/year)												2513	(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													
	115.7401	102.7107	109.8156	98.0017	96.0330	87.6393	87.1996	89.9767	90.2250	99.3047	104.0305	114.6473	(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	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	145.5572	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	154.3290	170.8642	154.3290	159.4733	154.3290	159.4733	154.3290	154.3290	159.4733	154.3290	159.4733	154.3290	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	305.9745	309.1495	301.1485	284.1152	262.6138	242.4054	228.9050	225.7300	233.7310	250.7643	272.2657	292.4741	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	37.5557	(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)													
	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	-116.4458	(71)
Water heating gains (Table 5)													
	155.5646	152.8434	147.6016	136.1134	129.0766	121.7213	117.2038	120.9364	125.3126	133.4740	144.4868	154.0958	(72)
Total internal gains													
	685.5352	702.5243	672.7462	649.3691	615.6865	590.2671	567.1050	567.6625	585.1840	608.2344	645.8930	670.5660	(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	1.5000	10.6334	0.6300	0.7000	0.7700	4.8746	(74)
East	13.5100	19.6403	0.6300	0.7000	0.7700	81.0913	(76)
South	4.7900	46.7521	0.6300	0.7000	0.7700	68.4397	(78)
West	14.4500	19.6403	0.6300	0.7000	0.7700	86.7335	(80)

Solar gains	241.1391	449.7032	699.2729	975.3244	1168.7797	1187.7483	1134.1586	989.7127	796.9968	521.5417	296.3957	201.2129	(83)
Total gains	926.6743	1152.2274	1372.0191	1624.6934	1784.4661	1778.0154	1701.2636	1557.3752	1382.1808	1129.7761	942.2886	871.7789	(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	60.5762	60.7048	60.8315	61.4337	61.5476	62.0839	62.0839	62.1842	61.8762	61.5476	61.3175	61.0787	
alpha	5.0384	5.0470	5.0554	5.0956	5.1032	5.1389	5.1389	5.1456	5.1251	5.1032	5.0878	5.0719	
util living area													
	0.9970	0.9906	0.9704	0.8977	0.7479	0.5526	0.4044	0.4590	0.7237	0.9494	0.9925	0.9978	(86)
MIT	19.6511	19.8945	20.2393	20.6443	20.8920	20.9814	20.9969	20.9942	20.9321	20.5580	20.0223	19.6122	(87)
Th 2	19.9386	19.9407	19.9426	19.9519	19.9536	19.9617	19.9617	19.9632	19.9586	19.9536	19.9501	19.9464	(88)
util rest of house													
	0.9959	0.9875	0.9606	0.8668	0.6864	0.4689	0.3103	0.3581	0.6381	0.9268	0.9895	0.9970	(89)
MIT 2	18.3743	18.6855	19.1196	19.6097	19.8705	19.9521	19.9608	19.9614	19.9167	19.5244	18.8568	18.3301	(90)
Living area fraction										fLA = Living area / (4) =		0.1241	(91)
MIT	18.5327	18.8355	19.2585	19.7381	19.9972	20.0799	20.0894	20.0895	20.0427	19.6527	19.0014	18.4892	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5327	18.8355	19.2585	19.7381	19.9972	20.0799	20.0894	20.0895	20.0427	19.6527	19.0014	18.4892	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9938	0.9828	0.9522	0.8595	0.6892	0.4787	0.3220	0.3706	0.6456	0.9185	0.9854	0.9953	(94)
Useful gains	920.9178	1132.4064	1306.4790	1396.3497	1229.8438	851.0951	547.7624	577.1717	892.3538	1037.6847	928.5633	867.6978	(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													
	2294.5096	2241.8320	2048.2200	1722.8661	1316.5150	861.9774	548.8741	579.4229	937.9114	1436.3817	1895.4747	2284.6644	(97)
Space heating kWh													
	1021.9522	745.5340	551.8553	235.0918	64.4833	0.0000	0.0000	0.0000	0.0000	296.6306	696.1762	1054.2231	(98a)
Space heating requirement - total per year (kWh/year)												4665.9466	
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													
	1021.9522	745.5340	551.8553	235.0918	64.4833	0.0000	0.0000	0.0000	0.0000	296.6306	696.1762	1054.2231	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4665.9466	
Space heating per m2											(98c) / (4) =	34.0580	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1021.9522	745.5340	551.8553	235.0918	64.4833	0.0000	0.0000	0.0000	0.0000	296.6306	696.1762	1054.2231	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	1107.2072	807.7291	597.8931	254.7040	69.8628	0.0000	0.0000	0.0000	0.0000	321.3766	754.2537	1142.1702	(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													
	249.1909	220.2042	233.8402	205.7398	199.4474	179.7596	177.6033	184.7419	186.8290	208.2438	221.2609	246.5226	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.8792	86.5737	85.9161	84.3596	81.8262	79.8000	79.8000	79.8000	79.8000	84.8528	86.4486	86.9416	(217)
Fuel for water heating, kWh/month													
	286.8248	254.3547	272.1727	243.8842	243.7452	225.2626	222.5605	231.5061	234.1215	245.4178	255.9451	283.5495	(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	32.0665	25.7249	23.1625	16.9698	13.1080	10.7093	11.9575	15.5429	20.1886	26.4886	29.9188	32.9577	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-62.6048	-85.9383	-120.2897	-131.5376	-138.7083	-128.2528	-126.5228	-120.8547	-110.5579	-96.3364	-67.9345	-54.3895	(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	-42.8174	-89.0969	-175.3704	-261.0085	-342.9245	-343.8751	-339.9571	-288.9535	-213.1962	-126.7683	-56.9391	-33.9458	(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												5055.1967	(211)

Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2999.3447 (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)	258.7951 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3558.7804 (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	4840.5561 (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	5055.1967	0.2100	1061.5913	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2999.3447	0.2100	629.8624	(264)
Space and water heating			1691.4537	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	258.7951	0.1443	37.3521	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1243.9274	0.1352	-168.1619	
PV Unit electricity exported	-2314.8530	0.1262	-292.0372	
Total			-460.1991	(269)
Total CO2, kg/year			1280.5360	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3500	(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	5055.1967	1.1300	5712.3723	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2999.3447	1.1300	3389.2595	(278)
Space and water heating			9101.6317	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	258.7951	1.5338	396.9486	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1243.9274	1.4997	-1865.4670	
PV Unit electricity exported	-2314.8530	0.4631	-1072.0031	
Total			-2937.4701	(283)
Total Primary energy kWh/year			6691.2111	(286)
Target Primary Energy Rate (TPER)			48.8400	(287)

Full SAP Calculation Printout

Property Reference	House Type L	Issued on Date	05/10/2023
Assessment Reference	Plot 19	Prop Type Ref	
Property			

SAP Rating	82 B	DER	3.62	TER	9.20
Environmental	96 A	% DER < TER			60.65
CO_2 Emissions (t/year)	0.48	DFEE	37.09	TFEE	41.08
Compliance Check	See BREL	% DFEE < TFEE			9.70
% DPER < TPER	21.45	DPER	37.84	TPER	48.18

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	80.0000 (1b)	x	2.4000 (2b)	=	192.0000 (1b)	-
First floor	65.0000 (1c)	x	2.4000 (2c)	=	156.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	348.0000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0287	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2287	(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) =	0.1944	(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	0.2479	0.2430	0.2382	0.2139	0.2090	0.1847	0.1847	0.1798	0.1944	0.2090	0.2187	0.2284	(22b)
Effective ac	0.5307	0.5295	0.5284	0.5229	0.5218	0.5171	0.5171	0.5162	0.5189	0.5218	0.5239	0.5261	(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	
Opening Type 1 (Uw = 1.20)			42.3000	1.1450	48.4351			(27)
Heatloss Floor 1			80.0000	0.1200	9.6000	110.0000	8800.0000	(28a)
External Wall 1	192.0000	42.3000	149.7000	0.1900	28.4430	190.0000	28443.0000	(29a)
External Roof 1	65.0000		65.0000	0.1500	9.7500	9.0000	585.0000	(30)
External Roof 2	16.0000		16.0000	0.1500	2.4000	9.0000	144.0000	(30)
Total net area of external elements Aum(A, m2)			353.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	98.6281			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 37972.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 261.8759 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	45.0000	0.0670	3.0150
E6 Intermediate floor within a dwelling	35.0000	0.0020	0.0700
E16 Corner (normal)	19.2000	0.0410	0.7872
E2 Other lintels (including other steel lintels)	26.6000	0.0240	0.6384
E3 Sill	21.4000	0.0190	0.4066
E4 Jamb	55.5400	0.0140	0.7776
E10 Eaves (insulation at ceiling level)	23.0000	0.0460	1.0580
E12 Gable (insulation at ceiling level)	10.0000	0.0330	0.3300

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.0828 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 105.7109 (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	60.9485	60.8115	60.6772	60.0464	59.9283	59.3789	59.3789	59.2772	59.5905	59.9283	60.1671	60.4167	(38)
Heat transfer coeff	166.6594	166.5224	166.3880	165.7572	165.6392	165.0898	165.0898	164.9880	165.3014	165.6392	165.8780	166.1276	(39)

Average = Sum(39)m / 12 = 165.7567

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1494	1.1484	1.1475	1.1432	1.1423	1.1386	1.1386	1.1378	1.1400	1.1423	1.1440	1.1457	(40)
HLP (average)												1.1431	
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 2.9261 (42)
Hot water usage for mixer showers

73.2803	72.1790	70.5742	67.5038	65.2380	62.7111	61.2748	62.8674	64.6132	67.3263	70.4626	72.9995	(42a)

Hot water usage for baths

31.6361	31.1663	30.5047	29.2847	28.3712	27.3583	26.8112	27.4682	28.1836	29.2674	30.5125	31.5292	(42b)

Hot water usage for other uses

44.5958	42.9741	41.3525	39.7308	38.1091	36.4875	36.4875	38.1091	39.7308	41.3525	42.9741	44.5958	(42c)

Average daily hot water use (litres/day) 137.4352 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.5122	146.3194	142.4313	136.5193	131.7183	126.5569	124.5735	128.4448	132.5276	137.9462	143.9493	149.1244	(44)
Energy conte	236.7907	208.3569	218.9117	186.8882	177.3182	155.6164	150.6608	159.0414	163.4197	187.1917	205.0821	233.4928	(45)

Energy content (annual) Total = Sum(45)m = 2282.7706

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

35.5186	31.2535	32.8368	28.0332	26.5977	23.3425	22.5991	23.8562	24.5130	28.0787	30.7623	35.0239	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
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)

Primary loss / Combi loss

Total heat required for water heating calculated for each month

290.1851	256.5841	272.3061	238.5602	230.7126	207.2884	204.0552	212.4358	215.0917	240.5861	256.7541	286.8872	(62)
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)
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)
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)
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)

WWHRS / PV diverter / Solar input / FGHRS

Output from w/h

290.1851	256.5841	272.3061	238.5602	230.7126	207.2884	204.0552	212.4358	215.0917	240.5861	256.7541	286.8872	(64)

Total per year (kWh/year) = Sum(64)m = 2911.4466 (64)
12Total per year (kWh/year) 2911 (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

121.4484	107.8604	115.5036	103.4779	101.6738	93.0801	92.8102	95.5968	95.6747	104.9567	109.5274	120.3519	(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	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.8959	175.9204	158.8959	164.1924	158.8959	164.1924	158.8959	158.8959	164.1924	158.8959	164.1924	158.8959	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	315.0288	318.2978	310.0600	292.5227	270.3850	249.5787	235.6787	232.4097	240.6475	258.1849	280.3226	301.1289	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	(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)													
	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	(71)

Water heating gains (Table 5)

	163.2371	160.5066	155.2468	143.7193	136.6584	129.2779	124.7450	128.4903	132.8815	141.0709	152.1214	161.7633 (72)

Total internal gains

	704.0527	721.6157	691.0936	667.3253	632.8301	609.9398	586.2105	586.6868	604.6123	625.0425	663.5272	688.6790 (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	11.7500	10.6334	0.7600	0.7000	0.7700	46.0632 (74)
East	14.0000	19.6403	0.7600	0.7000	0.7700	101.3725 (76)
South	12.4000	46.7521	0.7600	0.7000	0.7700	213.7309 (78)
West	4.1500	19.6403	0.7600	0.7000	0.7700	30.0497 (80)

Solar gains	391.2164	695.1551	1018.8574	1361.7040	1605.5632	1626.5453	1554.8021	1369.7063	1138.0462	787.3928	474.0370	331.1590 (83)
Total gains	1095.2691	1416.7709	1709.9510	2029.0293	2238.3933	2236.4851	2141.0125	1956.3931	1742.6585	1412.4353	1137.5643	1019.8380 (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	63.2894	63.3415	63.3926	63.6339	63.6792	63.8912	63.8912	63.9306	63.8094	63.6792	63.5876	63.4920	
alpha	5.2193	5.2228	5.2262	5.2423	5.2453	5.2594	5.2594	5.2620	5.2540	5.2453	5.2392	5.2328	
util living area	0.9953	0.9828	0.9454	0.8349	0.6547	0.4676	0.3385	0.3863	0.6283	0.9106	0.9873	0.9967	(86)
Living	19.7935	20.0816	20.4326	20.7777	20.9466	20.9922	20.9988	20.9977	20.9674	20.6885	20.1565	19.7347	
Non living	18.5693	18.9340	19.3665	19.7626	19.9277	19.9657	19.9692	19.9694	19.9497	19.6795	19.0347	18.4965	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	14	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	17	28	15	0	0	0	0	0	0	0	0	31	
MIT	20.6253	20.4798	20.5516	20.7777	20.9466	20.9922	20.9988	20.9977	20.9674	20.6885	20.1565	20.2834	(87)
Th 2	19.9607	19.9615	19.9622	19.9657	19.9664	19.9695	19.9695	19.9700	19.9683	19.9664	19.9651	19.9637	(88)
util rest of house	0.9937	0.9773	0.9291	0.7946	0.5928	0.3945	0.2597	0.3007	0.5450	0.8766	0.9824	0.9956	(89)
MIT 2	19.6239	19.5080	19.5275	19.7626	19.9277	19.9657	19.9692	19.9694	19.9497	19.6795	19.0347	19.3161	(90)
Living area fraction									fLA = Living area / (4) =			0.1793	(91)
MIT	19.8035	19.6822	19.7112	19.9446	20.1103	20.1498	20.1538	20.1538	20.1322	19.8604	19.2358	19.4896	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8035	19.6822	19.7112	19.9446	20.1103	20.1498	20.1538	20.1538	20.1322	19.8604	19.2358	19.4896	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9934	0.9755	0.9244	0.7937	0.6018	0.4074	0.2738	0.3161	0.5587	0.8724	0.9775	0.9949	(94)
Useful gains	1088.0799	1382.0733	1580.6848	1610.4477	1346.9721	911.2387	586.2241	618.3288	973.7061	1232.2210	1111.9670	1014.6705	(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	2583.8012	2461.5738	2198.1799	1830.7220	1393.0837	916.2084	586.6946	619.3250	997.1238	1533.8902	2013.0656	2540.0162	(97)
Space heating kWh	1112.8167	725.4243	459.4163	158.5976	34.3070	0.0000	0.0000	0.0000	0.0000	224.4419	648.7910	1134.8572	(98a)
Space heating requirement - total per year (kWh/year)												4498.6520	
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	1112.8167	725.4243	459.4163	158.5976	34.3070	0.0000	0.0000	0.0000	0.0000	224.4419	648.7910	1134.8572	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4498.6520	
Space heating per m2											(98c) / (4) =	31.0252	(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 %) 306.3785 (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	1112.8167	725.4243	459.4163	158.5976	34.3070	0.0000	0.0000	0.0000	0.0000	224.4419	648.7910	1134.8572	(98)
Space heating efficiency (main heating system 1)	306.3785	306.3785	306.3785	306.3785	306.3785	0.0000	0.0000	0.0000	0.0000	306.3785	306.3785	306.3785	(210)
Space heating fuel (main heating system)	363.2163	236.7739	149.9506	51.7652	11.1976	0.0000	0.0000	0.0000	0.0000	73.2564	211.7613	370.4102	(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

290.1851	256.5841	272.3061	238.5602	230.7126	207.2884	204.0552	212.4358	215.0917	240.5861	256.7541	286.8872 (64)

Efficiency of water heater

											168.5784 (216)
(217)m	168.5784	168.5784	168.5784	168.5784	168.5784	168.5784	168.5784	168.5784	168.5784	168.5784	168.5784 (217)

Fuel for water heating, kWh/month

172.1366	152.2046	161.5308	141.5129	136.8577	122.9626	121.0447	126.0160	127.5915	142.7146	152.3054	170.1803 (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 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	43.2825	34.7228	31.2640	22.9054	17.6928	14.4551	16.1399	20.9793	27.2500	35.7535	40.3835	44.4854 (232)

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

(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

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

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	1468.3316 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	168.5784
Water heating fuel used	1727.0577 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	349.3142 (232)

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

PV generation	0.0000 (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	3544.7035 (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	1468.3316	0.1575	231.2267	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1727.0577	0.1410	243.4449	(264)
Space and water heating			474.6716	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	349.3142	0.1443	50.4168	(268)
Total CO2, kg/year			525.0885	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6200	(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	1468.3316	1.5829	2324.2673	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1727.0577	1.5212	2627.2338	(278)
Space and water heating			4951.5011	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	349.3142	1.5338	535.7898	(282)
Total Primary energy kWh/year			5487.2909	(286)
Dwelling Primary energy Rate (DPER)			37.8400	(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	80.0000 (1b)	x	2.4000 (2b)	=	192.0000 (1b)	-
First floor	65.0000 (1c)	x	2.4000 (2c)	=	156.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	145.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	348.0000	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1149	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(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)
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	
TER Opening Type (Uw = 1.20)			36.2600	1.1450	41.5191			(27)
Heatloss Floor 1			80.0000	0.1300	10.4000			(28a)
External Wall 1	192.0000	36.2600	155.7400	0.1800	28.0332			(29a)
External Roof 1	65.0000		65.0000	0.1100	7.1500			(30)
External Roof 2	16.0000		16.0000	0.1100	1.7600			(30)
Total net area of external elements Aum(A, m2)			353.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		88.8623			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 261.8759 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	45.0000	0.1600	7.2000
E6 Intermediate floor within a dwelling	35.0000	0.0000	0.0000
E16 Corner (normal)	19.2000	0.0900	1.7280
E2 Other lintels (including other steel lintels)	26.6000	0.0500	1.3300
E3 Sill	21.4000	0.0500	1.0700
E4 Jamb	55.5400	0.0500	2.7770
E10 Eaves (insulation at ceiling level)	23.0000	0.0600	1.3800
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.0850 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 104.9473 (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	66.4019	66.0532	65.7113	64.1055	63.8051	62.4065	62.4065	62.1475	62.9452	63.8051	64.4129	65.0483	(38)
Heat transfer coeff	171.3492	171.0004	170.6586	169.0528	168.7524	167.3538	167.3538	167.0948	167.8925	168.7524	169.3601	169.9955	(39)

Average = Sum(39)m / 12 = 169.0514

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1817	1.1793	1.1770	1.1659	1.1638	1.1542	1.1542	1.1524	1.1579	1.1638	1.1680	1.1724	(40)
HLP (average)												1.1659	
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 2.9261 (42)

Hot water usage for mixer showers

73.2803	72.1790	70.5742	67.5038	65.2380	62.7111	61.2748	62.8674	64.6132	67.3263	70.4626	72.9995 (42a)

Hot water usage for baths

31.6361	31.1663	30.5047	29.2847	28.3712	27.3583	26.8112	27.4682	28.1836	29.2674	30.5125	31.5292 (42b)

Hot water usage for other uses

44.5958	42.9741	41.3525	39.7308	38.1091	36.4875	36.4875	38.1091	39.7308	41.3525	42.9741	44.5958 (42c)

Average daily hot water use (litres/day) 137.4352 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.5122	146.3194	142.4313	136.5193	131.7183	126.5569	124.5735	128.4448	132.5276	137.9462	143.9493	149.1244	(44)
Energy conte	236.7907	208.3569	218.9117	186.8882	177.3182	155.6164	150.6608	159.0414	163.4197	187.1917	205.0821	233.4928	(45)

Energy content (annual) Total = Sum(45)m = 2282.7706

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

35.5186	31.2535	32.8368	28.0332	26.5977	23.3425	22.5991	23.8562	24.5130	28.0787	30.7623	35.0239 (46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)

Total heat required for water heating calculated for each month

283.3856	250.4426	265.5066	231.9800	223.9131	200.7083	197.2557	205.6363	208.5116	233.7866	250.1739	280.0877 (62)

WWHRS	-33.5007	-29.6283	-31.0250	-25.6899	-23.9421	-20.4874	-19.2037	-20.4212	-21.1971	-24.9890	-28.3095	-32.8803 (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

249.8849	220.8143	234.4816	206.2901	199.9710	180.2209	178.0520	185.2151	187.3145	208.7975	221.8644	247.2074 (64)

Total per year (kWh/year) = Sum(64)m = 2520.1138 (64)

12Total per year (kWh/year) 2520 (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

116.0088	102.9472	110.0641	98.2138	96.2342	87.8159	87.3706	90.1572	90.4105	99.5171	104.2633	114.9123 (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	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	146.3030	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.8959	175.9204	158.8959	164.1924	158.8959	164.1924	158.8959	158.8959	164.1924	158.8959	164.1924	158.8959	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	315.0288	318.2978	310.0600	292.5227	270.3850	249.5787	235.6787	232.4097	240.6475	258.1849	280.3226	301.1289	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	37.6303	(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)													
	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	-117.0424	(71)
Water heating gains (Table 5)													
	155.9259	153.1953	147.9356	136.4080	129.3471	121.9666	117.4337	121.1790	125.5702	133.7596	144.8101	154.4520	(72)
Total internal gains													
	699.7414	717.3044	686.7823	663.0140	628.5188	602.6285	578.8992	579.3755	597.3010	620.7312	659.2160	684.3677	(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	10.0700	10.6334	0.6300	0.7000	0.7700	32.7245	(74)
East	12.0000	19.6403	0.6300	0.7000	0.7700	72.0278	(76)
South	10.6300	46.7521	0.6300	0.7000	0.7700	151.8819	(78)
West	3.5600	19.6403	0.6300	0.7000	0.7700	21.3683	(80)

Solar gains	278.0025	493.9841	724.0077	967.6310	1140.9112	1155.8177	1104.8386	973.3150	808.7024	559.5286	336.8556	235.3251	(83)
Total gains	977.7439	1211.2886	1410.7900	1630.6450	1769.4300	1758.4462	1683.7378	1552.6905	1406.0034	1180.2598	996.0716	919.6927	(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	61.5572	61.6827	61.8063	62.3934	62.5045	63.0268	63.0268	63.1245	62.8246	62.5045	62.2802	62.0474	
alpha	5.1038	5.1122	5.1204	5.1596	5.1670	5.2018	5.2018	5.2083	5.1883	5.1670	5.1520	5.1365	
util living area													
	0.9973	0.9915	0.9750	0.9163	0.7838	0.5902	0.4340	0.4885	0.7479	0.9538	0.9931	0.9980	(86)
MIT	19.6633	19.8998	20.2206	20.6082	20.8702	20.9763	20.9960	20.9928	20.9239	20.5527	20.0305	19.6245	(87)
Th 2	19.9347	19.9366	19.9385	19.9474	19.9491	19.9568	19.9568	19.9583	19.9538	19.9491	19.9457	19.9422	(88)
util rest of house													
	0.9963	0.9886	0.9663	0.8888	0.7238	0.5022	0.3329	0.3813	0.6622	0.9325	0.9902	0.9973	(89)
MIT 2	18.3845	18.6870	19.0920	19.5660	19.8475	19.9446	19.9557	19.9560	19.9066	19.5139	18.8618	18.3403	(90)
Living area fraction											fLA = Living area / (4) =		0.1793 (91)
MIT	18.6138	18.9044	19.2944	19.7529	20.0309	20.1296	20.1422	20.1419	20.0890	19.7002	19.0714	18.5705	(92)
Temperature adjustment													0.0000
adjusted MIT	18.6138	18.9044	19.2944	19.7529	20.0309	20.1296	20.1422	20.1419	20.0890	19.7002	19.0714	18.5705	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9945	0.9846	0.9594	0.8828	0.7289	0.5172	0.3511	0.4006	0.6742	0.9260	0.9868	0.9959	(94)
Useful gains	972.3436	1192.6397	1353.4960	1439.4598	1289.7303	909.5553	591.1216	621.9728	947.9791	1092.9370	982.8879	915.8879	(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													
	2452.6583	2394.7630	2183.4754	1834.7075	1405.8600	925.3964	592.8075	625.2566	1005.5038	1535.6768	2027.4731	2442.9263	(97)
Space heating kWh													
	1101.3542	807.8268	617.5047	284.5783	86.4005	0.0000	0.0000	0.0000	0.0000	329.3984	752.1013	1136.1166	(98a)
Space heating requirement - total per year (kWh/year)												5115.2808	
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													
	1101.3542	807.8268	617.5047	284.5783	86.4005	0.0000	0.0000	0.0000	0.0000	329.3984	752.1013	1136.1166	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5115.2808	
Space heating per m2											(98c) / (4) =		35.2778 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1101.3542	807.8268	617.5047	284.5783	86.4005	0.0000	0.0000	0.0000	0.0000	329.3984	752.1013	1136.1166	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	1193.2331	875.2187	669.0192	308.3189	93.6083	0.0000	0.0000	0.0000	0.0000	356.8780	814.8443	1230.8955	(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													
	249.8849	220.8143	234.4816	206.2901	199.9710	180.2209	178.0520	185.2151	187.3145	208.7975	221.8644	247.2074	(64)
Efficiency of water heater													79.8000 (216)
(217)m	86.9858	86.7009	86.1267	84.7816	82.3171	79.8000	79.8000	79.8000	79.8000	85.0775	86.5758	87.0456	(217)
Fuel for water heating, kWh/month													
	287.2711	254.6851	272.2520	243.3194	242.9275	225.8407	223.1228	232.0992	234.7300	245.4205	256.2662	283.9976	(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	33.0154	26.4862	23.8479	17.4720	13.4959	11.0262	12.3114	16.0028	20.7860	27.2724	30.8041	33.9330	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-68.1025	-92.7650	-128.8526	-139.7826	-146.4792	-135.0989	-133.2577	-127.7255	-117.5556	-103.4306	-73.6330	-59.2519	(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	-49.0332	-101.7186	-199.6586	-296.3798	-388.6684	-389.4877	-385.0533	-327.6170	-242.1712	-144.4635	-65.1156	-38.8985	(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													5542.0160 (211)

Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3001.9320 (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)	266.4534 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3954.2004 (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	4942.2009 (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	5542.0160	0.2100	1163.8234	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3001.9320	0.2100	630.4057	(264)
Space and water heating			1794.2291	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	266.4534	0.1443	38.4575	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1325.9351	0.1354	-179.4754	
PV Unit electricity exported	-2628.2654	0.1262	-331.7829	
Total			-511.2584	(269)
Total CO2, kg/year			1333.3574	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2000	(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	5542.0160	1.1300	6262.4781	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3001.9320	1.1300	3392.1832	(278)
Space and water heating			9654.6612	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	266.4534	1.5338	408.6951	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1325.9351	1.5003	-1989.3026	
PV Unit electricity exported	-2628.2654	0.4634	-1217.9101	
Total			-3207.2127	(283)
Total Primary energy kWh/year			6986.2444	(286)
Target Primary Energy Rate (TPER)			48.1800	(287)

Full SAP Calculation Printout

Property Reference	House Type J	Issued on Date	05/10/2023
Assessment Reference	Plot 20	Prop Type Ref	
Property			

SAP Rating	82 B	DER	3.90	TER	9.39
Environmental	96 A	% DER < TER			58.47
CO_2 Emissions (t/year)	0.45	DFEE	35.82	TFEE	39.48
Compliance Check	See BREL	% DFEE < TFEE			9.26
% DPER < TPER	16.53	DPER	40.93	TPER	49.03

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	70.0000 (1b)	x	2.4000 (2b)	=	168.0000 (1b)	-
First floor	56.0000 (1c)	x	2.4000 (2c)	=	134.4000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	302.4000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0331	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2331	(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) =	0.1981	(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	0.2526	0.2476	0.2427	0.2179	0.2130	0.1882	0.1882	0.1833	0.1981	0.2130	0.2229	0.2328	(22b)
Effective ac	0.5319	0.5307	0.5294	0.5237	0.5227	0.5177	0.5177	0.5168	0.5196	0.5227	0.5248	0.5271	(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	
Opening Type 1 (Uw = 1.20)			35.5000	1.1450	40.6489			(27)
Heatloss Floor 1			70.0000	0.1200	8.4000	110.0000	7700.0000	(28a)
External Wall 1	172.0000	35.5000	136.5000	0.1900	25.9350	190.0000	25935.0000	(29a)
External Roof 1	14.0000		14.0000	0.1500	2.1000	9.0000	126.0000	(30)
External Roof 2	56.0000		56.0000	0.1500	8.4000	9.0000	504.0000	(30)
Total net area of external elements Aum(A, m2)			312.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	85.4839			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 34265.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 271.9444 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	40.0000	0.0670	2.6800
E6 Intermediate floor within a dwelling	32.0000	0.0020	0.0640
E2 Other lintels (including other steel lintels)	19.7000	0.0240	0.4728
E3 Sill	14.3000	0.0190	0.2717
E4 Jamb	43.9000	0.0140	0.6146
E10 Eaves (insulation at ceiling level)	18.0000	0.0460	0.8280
E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3271 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 90.8110 (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	53.0794	52.9558	52.8346	52.2655	52.1590	51.6633	51.6633	51.5715	51.8543	52.1590	52.3744	52.5996	(38)
Heat transfer coeff	143.8904	143.7667	143.6456	143.0765	142.9700	142.4743	142.4743	142.3825	142.6652	142.9700	143.1854	143.4106	(39)

Average = Sum(39)m / 12 = 143.0759

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1420	1.1410	1.1400	1.1355	1.1347	1.1307	1.1307	1.1300	1.1323	1.1347	1.1364	1.1382	(40)
HLP (average)												1.1355	
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 2.8838 (42)
Hot water usage for mixer showers

72.5718	71.4812	69.8920	66.8513	64.6073	62.1048	60.6824	62.2596	63.9886	66.6754	69.7815	72.2938	(42a)

Hot water usage for baths

31.3315	30.8662	30.2109	29.0027	28.0980	27.0949	26.5531	27.2037	27.9122	28.9856	30.2187	31.2256	(42b)

Hot water usage for other uses

44.1631	42.5572	40.9512	39.3453	37.7394	36.1334	36.1334	37.7394	39.3453	40.9512	42.5572	44.1631	(42c)

Average daily hot water use (litres/day) 136.1063 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.0664	144.9046	141.0541	135.1993	130.4447	125.3332	123.3689	127.2028	131.2461	136.6123	142.5573	147.6825	(44)
Energy conte	234.5010	206.3422	216.7950	185.0811	175.6037	154.1118	149.2040	157.5036	161.8395	185.3816	203.0990	231.2350	(45)

Energy content (annual) Total = Sum(45)m = 2260.6975

Distribution loss (46)m = 0.15 x (45)m	35.1752	30.9513	32.5192	27.7622	26.3405	23.1168	22.3806	23.6255	24.2759	27.8072	30.4649	34.6853	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

287.8954	254.5694	270.1894	236.7531	228.9981	205.7838	202.5984	210.8980	213.5115	238.7760	254.7710	284.6294	(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

287.8954	254.5694	270.1894	236.7531	228.9981	205.7838	202.5984	210.8980	213.5115	238.7760	254.7710	284.6294	(64)

Total per year (kWh/year) = Sum(64)m = 2889.3735 (64)
12Total per year (kWh/year) 2889 (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

120.6871	107.1905	114.7998	102.8771	101.1037	92.5798	92.3259	95.0855	95.1492	104.3549	108.8680	119.6012	(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	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	147.7001	163.5251	147.7001	152.6234	147.7001	152.6234	147.7001	147.7001	152.6234	147.7001	152.6234	147.7001	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	292.8319	295.8706	288.2132	271.9116	251.3337	231.9934	219.0729	216.0342	223.6916	239.9932	260.5711	279.9114	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	(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)													
	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	(71)
Water heating gains (Table 5)													

	162.2139	159.5097	154.3009	142.8848	135.8921	128.5830	124.0939	127.8030	132.1517	140.2620	151.2056	160.7543 (72)
Total internal gains	669.0030	685.1626	656.4713	633.6770	601.1831	579.4570	557.1240	557.7945	574.7239	594.2124	630.6573	654.6229 (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	11.9000	10.6334	0.7600	0.7000	0.7700	46.6513 (74)
East	7.1000	19.6403	0.7600	0.7000	0.7700	51.4103 (76)
South	11.8000	46.7521	0.7600	0.7000	0.7700	203.3891 (78)
West	4.7000	19.6403	0.7600	0.7000	0.7700	34.0322 (80)

Solar gains	335.4829	589.3957	851.0636	1124.3506	1319.5245	1335.4853	1277.0078	1128.1345	945.5252	663.7336	405.1726	284.9015 (83)
Total gains	1004.4860	1274.5583	1507.5350	1758.0275	1920.7075	1914.9423	1834.1318	1685.9290	1520.2491	1257.9460	1035.8299	939.5244 (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	66.1480	66.2048	66.2607	66.5243	66.5738	66.8054	66.8054	66.8485	66.7160	66.5738	66.4737	66.3693	
alpha	5.4099	5.4137	5.4174	5.4350	5.4383	5.4537	5.4537	5.4566	5.4477	5.4383	5.4316	5.4246	
util living area	0.9948	0.9818	0.9452	0.8380	0.6605	0.4718	0.3411	0.3871	0.6248	0.9059	0.9860	0.9963	(86)
Living	19.8817	20.1528	20.4756	20.7943	20.9513	20.9933	20.9991	20.9982	20.9724	20.7230	20.2273	19.8256	
Non living	18.6819	19.0244	19.4211	19.7855	19.9378	19.9726	19.9756	19.9759	19.9592	19.7213	19.1245	18.6126	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	6	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	25	10	0	0	0	0	0	0	0	0	0	31	
MIT	20.4892	20.2840	20.4756	20.7943	20.9513	20.9933	20.9991	20.9982	20.9724	20.7230	20.2273	20.3348	(87)
Th 2	19.9667	19.9675	19.9683	19.9719	19.9726	19.9758	19.9758	19.9764	19.9746	19.9726	19.9712	19.9698	(88)
util rest of house	0.9930	0.9759	0.9284	0.7975	0.5981	0.3983	0.2621	0.3017	0.5414	0.8701	0.9804	0.9950	(89)
MIT 2	19.5094	19.2126	19.4211	19.7855	19.9378	19.9726	19.9756	19.9759	19.9592	19.7213	19.1245	19.3708	(90)
Living area fraction										fLA = Living area / (4) =		0.1429	(91)
MIT	19.6493	19.3656	19.5718	19.9296	20.0826	20.1184	20.1218	20.1219	20.1040	19.8644	19.2821	19.5085	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6493	19.3656	19.5718	19.9296	20.0826	20.1184	20.1218	20.1219	20.1040	19.8644	19.2821	19.5085	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9923	0.9714	0.9206	0.7956	0.6050	0.4087	0.2734	0.3139	0.5524	0.8656	0.9752	0.9942	(94)
Useful gains	996.7207	1238.1419	1387.8249	1398.7507	1162.0430	782.6114	501.4514	529.2764	839.7163	1088.8882	1010.1180	934.1211	(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	2208.6214	2079.6776	1877.7014	1578.0804	1198.4547	786.2333	501.7616	529.9341	856.5561	1324.5356	1744.2934	2195.3996	(97)
Space heating kWh	901.6541	565.5119	364.4682	129.1174	27.0903	0.0000	0.0000	0.0000	0.0000	175.3217	528.6063	938.3912	(98a)
Space heating requirement - total per year (kWh/year)												3630.1611	
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	901.6541	565.5119	364.4682	129.1174	27.0903	0.0000	0.0000	0.0000	0.0000	175.3217	528.6063	938.3912	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3630.1611	
Space heating per m2											(98c) / (4) =	28.8108	(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 %) 294.4427 (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	901.6541	565.5119	364.4682	129.1174	27.0903	0.0000	0.0000	0.0000	0.0000	175.3217	528.6063	938.3912	(98)
Space heating efficiency (main heating system 1)	294.4427	294.4427	294.4427	294.4427	294.4427	0.0000	0.0000	0.0000	0.0000	294.4427	294.4427	294.4427	(210)
Space heating fuel (main heating system)	306.2240	192.0618	123.7824	43.8514	9.2005	0.0000	0.0000	0.0000	0.0000	59.5436	179.5277	318.7008	(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												
	287.8954	254.5694	270.1894	236.7531	228.9981	205.7838	202.5984	210.8980	213.5115	238.7760	254.7710	284.6294 (64)
Efficiency of water heater												162.1807 (216)
(217)m	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807 (217)
Fuel for water heating, kWh/month												
	177.5152	156.9665	166.5977	145.9810	141.1993	126.8855	124.9214	130.0389	131.6504	147.2284	157.0908	175.5014 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	39.9803	32.0737	28.8788	21.1579	16.3429	13.3523	14.9086	19.3787	25.1711	33.0258	37.3026	41.0915 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1232.8922 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	162.1807
Water heating fuel used	1781.5767 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	322.6643 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	3337.1332 (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	1232.8922	0.1575	194.2232	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1781.5767	0.1410	251.1214	(264)
Space and water heating			445.3446	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	322.6643	0.1443	46.5704	(268)
Total CO2, kg/year			491.9150	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.9000	(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	1232.8922	1.5831	1951.8438	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1781.5767	1.5212	2710.1376	(278)
Space and water heating			4661.9813	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	322.6643	1.5338	494.9133	(282)
Total Primary energy kWh/year			5156.8946	(286)
Dwelling Primary energy Rate (DPER)			40.9300	(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	70.0000 (1b)	x	2.4000 (2b)	=	168.0000 (1b)	-
First floor	56.0000 (1c)	x	2.4000 (2c)	=	134.4000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	302.4000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1323 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3823 (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) =	0.3249 (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	0.4143	0.4062	0.3980	0.3574	0.3493	0.3087	0.3087	0.3006	0.3249	0.3493	0.3656	0.3818	(22b)
Effective ac	0.5858	0.5825	0.5792	0.5639	0.5610	0.5476	0.5476	0.5452	0.5528	0.5610	0.5668	0.5729	(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 Opening Type (Uw = 1.20)			31.5000	1.1450	36.0687			(27)
Heatloss Floor 1			70.0000	0.1300	9.1000			(28a)
External Wall 1	172.0000	31.5000	140.5000	0.1800	25.2900			(29a)
External Roof 1	14.0000		14.0000	0.1100	1.5400			(30)
External Roof 2	56.0000		56.0000	0.1100	6.1600			(30)
Total net area of external elements Aum(A, m2)			312.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.1587			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			271.9444 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	40.0000	0.1600	6.4000
E6 Intermediate floor within a dwelling	32.0000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	19.7000	0.0500	0.9850
E3 Sill	14.3000	0.0500	0.7150
E4 Jamb	43.9000	0.0500	2.1950
E10 Eaves (insulation at ceiling level)	18.0000	0.0600	1.0800
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.0950 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	90.2537 (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	58.4600	58.1274	57.8015	56.2704	55.9840	54.6505	54.6505	54.4035	55.1641	55.9840	56.5635	57.1693	(38)
Heat transfer coeff	148.7137	148.3811	148.0552	146.5241	146.2377	144.9042	144.9042	144.6572	145.4178	146.2377	146.8172	147.4230	(39)

Average = Sum(39)m / 12 = 146.5228

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1803	1.1776	1.1750	1.1629	1.1606	1.1500	1.1500	1.1481	1.1541	1.1606	1.1652	1.1700	(40)
HLP (average)												1.1629	
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 2.8838 (42)

Hot water usage for mixer showers

	72.5718	71.4812	69.8920	66.8513	64.6073	62.1048	60.6824	62.2596	63.9886	66.6754	69.7815	72.2938 (42a)

Hot water usage for baths

	31.3315	30.8662	30.2109	29.0027	28.0980	27.0949	26.5531	27.2037	27.9122	28.9856	30.2187	31.2256 (42b)

Hot water usage for other uses

	44.1631	42.5572	40.9512	39.3453	37.7394	36.1334	36.1334	37.7394	39.3453	40.9512	42.5572	44.1631 (42c)

Average daily hot water use (litres/day) 136.1063 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.0664	144.9046	141.0541	135.1993	130.4447	125.3332	123.3689	127.2028	131.2461	136.6123	142.5573	147.6825	(44)
Energy conte	234.5010	206.3422	216.7950	185.0811	175.6037	154.1118	149.2040	157.5036	161.8395	185.3816	203.0990	231.2350	(45)
Energy content (annual)										Total = Sum(45)m =		2260.6975	
Distribution loss (46)m = 0.15 x (45)m													
	35.1752	30.9513	32.5192	27.7622	26.3405	23.1168	22.3806	23.6255	24.2759	27.8072	30.4649	34.6853	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	281.0959	248.4279	263.3899	230.1729	222.1986	199.2036	195.7989	204.0985	206.9314	231.9765	248.1909	277.8299	(62)
WWHRS	-33.1768	-29.3418	-30.7251	-25.4416	-23.7107	-20.2894	-19.0181	-20.2238	-20.9922	-24.7474	-28.0359	-32.5624	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	247.9191	219.0860	232.6648	204.7313	198.4879	178.9142	176.7809	183.8747	185.9392	207.2290	220.1550	245.2675	(64)
										Total per year (kWh/year) = Sum(64)m =		2501.0498	(64)
12Total per year (kWh/year)												2501	(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													
	115.2475	102.2773	109.3602	97.6129	95.6641	87.3156	86.8863	89.6459	89.8851	98.9153	103.6039	114.1616	(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	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	147.7001	163.5251	147.7001	152.6234	147.7001	152.6234	147.7001	147.7001	152.6234	147.7001	152.6234	147.7001	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	292.8319	295.8706	288.2132	271.9116	251.3337	231.9934	219.0729	216.0342	223.6916	239.9932	260.5711	279.9114	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	(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)													
	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	(71)
Water heating gains (Table 5)													
	154.9026	152.1984	146.9896	135.5735	128.5808	121.2717	116.7826	120.4918	124.8404	132.9507	143.8943	153.4430	(72)
Total internal gains													
	664.6917	680.8513	652.1600	629.3657	596.8718	572.1457	549.8127	550.4832	567.4126	589.9011	626.3460	650.3116	(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	10.5600	10.6334	0.6300	0.7000	0.7700	34.3169	(74)
East	6.3000	19.6403	0.6300	0.7000	0.7700	37.8146	(76)
South	10.4700	46.7521	0.6300	0.7000	0.7700	149.5958	(78)
West	4.1700	19.6403	0.6300	0.7000	0.7700	25.0297	(80)

Solar gains	246.7569	433.5174	625.9836	826.9984	970.5593	982.3008	939.2876	829.7831	695.4643	488.1955	298.0157	209.5528	(83)
Total gains	911.4487	1114.3687	1278.1437	1456.3641	1567.4311	1554.4465	1489.1004	1380.2662	1262.8768	1078.0966	924.3617	859.8644	(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	64.0026	64.1460	64.2872	64.9590	65.0862	65.6852	65.6852	65.7973	65.4532	65.0862	64.8293	64.5629	
alpha	5.2668	5.2764	5.2858	5.3306	5.3391	5.3790	5.3790	5.3865	5.3635	5.3391	5.3220	5.3042	
util living area	0.9968	0.9904	0.9729	0.9121	0.7770	0.5811	0.4256	0.4771	0.7327	0.9477	0.9919	0.9976	(86)
MIT	19.7534	19.9823	20.2844	20.6471	20.8871	20.9808	20.9970	20.9946	20.9379	20.6036	20.1082	19.7164	(87)
Th 2	19.9358	19.9379	19.9400	19.9498	19.9516	19.9602	19.9602	19.9618	19.9569	19.9516	19.9479	19.9441	(88)
util rest of house	0.9956	0.9870	0.9633	0.8830	0.7157	0.4936	0.3264	0.3721	0.6455	0.9236	0.9884	0.9967	(89)
MIT 2	18.4959	18.7883	19.1688	19.6106	19.8651	19.9506	19.9594	19.9601	19.9197	19.5728	18.9576	18.4546	(90)
Living area fraction										fLA = Living area / (4) =		0.1429	(91)
MIT	18.6755	18.9588	19.3282	19.7586	20.0111	20.0977	20.1076	20.1079	20.0651	19.7200	19.1219	18.6349	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6755	18.9588	19.3282	19.7586	20.0111	20.0977	20.1076	20.1079	20.0651	19.7200	19.1219	18.6349	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9935	0.9826	0.9560	0.8768	0.7195	0.5055	0.3406	0.3871	0.6553	0.9169	0.9845	0.9951	(94)
Useful gains	905.5539	1095.0026	1221.9647	1276.9229	1127.7205	785.8361	507.2315	534.3537	827.5533	988.4859	910.0377	855.6610	(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	2137.8340	2086.0681	1899.2784	1591.0516	1215.3984	796.6458	508.2645	536.3754	867.4339	1333.6933	1765.0269	2128.0348	(97)
Space heating kWh	916.8164	665.9960	503.9213	226.1727	65.2323	0.0000	0.0000	0.0000	0.0000	256.8343	615.5923	946.6461	(98a)
Space heating requirement - total per year (kWh/year)												4197.2114	
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	916.8164	665.9960	503.9213	226.1727	65.2323	0.0000	0.0000	0.0000	0.0000	256.8343	615.5923	946.6461	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4197.2114	
Space heating per m2										(98c) / (4) =		33.3112	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	916.8164	665.9960	503.9213	226.1727	65.2323	0.0000	0.0000	0.0000	0.0000	256.8343	615.5923	946.6461	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	993.3005	721.5558	545.9603	245.0408	70.6742	0.0000	0.0000	0.0000	0.0000	278.2604	666.9472	1025.6187	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	247.9191	219.0860	232.6648	204.7313	198.4879	178.9142	176.7809	183.8747	185.9392	207.2290	220.1550	245.2675	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.7182	86.3883	85.7454	84.2837	81.8520	79.8000	79.8000	79.8000	79.8000	84.5422	86.2379	86.7859	(217)
Fuel for water heating, kWh/month	285.8904	253.6062	271.3438	242.9075	242.4961	224.2033	221.5299	230.4194	233.0065	245.1191	255.2879	282.6122	(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	30.6892	24.6200	22.1676	16.2409	12.5449	10.2493	11.4439	14.8752	19.3215	25.3508	28.6337	31.5421	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-60.6550	-83.1566	-116.2561	-126.9780	-133.7906	-123.6817	-122.0263	-116.6195	-106.7695	-93.1608	-65.7865	-52.7097	(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	-41.8388	-87.0165	-171.1912	-254.6641	-334.4635	-335.3316	-331.4959	-281.8051	-207.9915	-123.7466	-55.6184	-33.1719	(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												4547.3580	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	79.8000
Water heating fuel used	2988.4225 (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)	247.6791 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3459.9254 (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	4409.5341 (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	4547.3580	0.2100	954.9452	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2988.4225	0.2100	627.5687	(264)
Space and water heating			1582.5139	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	247.6791	0.1443	35.7477	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1201.5903	0.1352	-162.4665	
PV Unit electricity exported	-2258.3350	0.1262	-284.9425	
Total			-447.4090	(269)
Total CO2, kg/year			1182.7819	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3900	(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	4547.3580	1.1300	5138.5145	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2988.4225	1.1300	3376.9174	(278)
Space and water heating			8515.4319	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	247.6791	1.5338	379.8985	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1201.5903	1.4997	-1802.0807	
PV Unit electricity exported	-2258.3350	0.4632	-1045.9621	
Total			-2848.0428	(283)
Total Primary energy kWh/year			6177.3884	(286)
Target Primary Energy Rate (TPER)			49.0300	(287)

Full SAP Calculation Printout

Property Reference	House Type J	Issued on Date	05/10/2023
Assessment Reference	Plot 21	Prop Type Ref	
Property			

SAP Rating	82 B	DER	3.90	TER	9.39
Environmental	96 A	% DER < TER			58.47
CO_2 Emissions (t/year)	0.45	DFEE	35.82	TFEE	39.48
Compliance Check	See BREL	% DFEE < TFEE			9.26
% DPER < TPER	16.53	DPER	40.93	TPER	49.03

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	70.0000 (1b)	x	2.4000 (2b)	=	168.0000 (1b)	-
First floor	56.0000 (1c)	x	2.4000 (2c)	=	134.4000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	302.4000	(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	1 * 10	=	10.0000 (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) =	10.0000 / (5)	=	0.0331 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			4.0000 (17)
Infiltration rate			0.2331 (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)	=	0.1981 (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	0.2526	0.2476	0.2427	0.2179	0.2130	0.1882	0.1882	0.1833	0.1981	0.2130	0.2229	0.2328	(22b)
Effective ac	0.5319	0.5307	0.5294	0.5237	0.5227	0.5177	0.5177	0.5168	0.5196	0.5227	0.5248	0.5271	(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	
Opening Type 1 (Uw = 1.20)			35.5000	1.1450	40.6489			(27)
Heatloss Floor 1			70.0000	0.1200	8.4000	110.0000	7700.0000	(28a)
External Wall 1	172.0000	35.5000	136.5000	0.1900	25.9350	190.0000	25935.0000	(29a)
External Roof 1	14.0000		14.0000	0.1500	2.1000	9.0000	126.0000	(30)
External Roof 2	56.0000		56.0000	0.1500	8.4000	9.0000	504.0000	(30)
Total net area of external elements Aum(A, m2)			312.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	85.4839			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 34265.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 271.9444 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	40.0000	0.0670	2.6800
E6 Intermediate floor within a dwelling	32.0000	0.0020	0.0640
E2 Other lintels (including other steel lintels)	19.7000	0.0240	0.4728
E3 Sill	14.3000	0.0190	0.2717
E4 Jamb	43.9000	0.0140	0.6146
E10 Eaves (insulation at ceiling level)	18.0000	0.0460	0.8280
E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3271 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 90.8110 (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	53.0794	52.9558	52.8346	52.2655	52.1590	51.6633	51.6633	51.5715	51.8543	52.1590	52.3744	52.5996	(38)
Heat transfer coeff	143.8904	143.7667	143.6456	143.0765	142.9700	142.4743	142.4743	142.3825	142.6652	142.9700	143.1854	143.4106	(39)

Average = Sum(39)m / 12 = 143.0759

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1420	1.1410	1.1400	1.1355	1.1347	1.1307	1.1307	1.1300	1.1323	1.1347	1.1364	1.1382	(40)
HLP (average)												1.1355	
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 2.8838 (42)
Hot water usage for mixer showers

72.5718	71.4812	69.8920	66.8513	64.6073	62.1048	60.6824	62.2596	63.9886	66.6754	69.7815	72.2938	(42a)

Hot water usage for baths

31.3315	30.8662	30.2109	29.0027	28.0980	27.0949	26.5531	27.2037	27.9122	28.9856	30.2187	31.2256	(42b)

Hot water usage for other uses

44.1631	42.5572	40.9512	39.3453	37.7394	36.1334	36.1334	37.7394	39.3453	40.9512	42.5572	44.1631	(42c)

Average daily hot water use (litres/day) 136.1063 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.0664	144.9046	141.0541	135.1993	130.4447	125.3332	123.3689	127.2028	131.2461	136.6123	142.5573	147.6825	(44)
Energy conte	234.5010	206.3422	216.7950	185.0811	175.6037	154.1118	149.2040	157.5036	161.8395	185.3816	203.0990	231.2350	(45)

Energy content (annual) Total = Sum(45)m = 2260.6975

Distribution loss (46)m = 0.15 x (45)m	35.1752	30.9513	32.5192	27.7622	26.3405	23.1168	22.3806	23.6255	24.2759	27.8072	30.4649	34.6853	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

287.8954	254.5694	270.1894	236.7531	228.9981	205.7838	202.5984	210.8980	213.5115	238.7760	254.7710	284.6294	(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

287.8954	254.5694	270.1894	236.7531	228.9981	205.7838	202.5984	210.8980	213.5115	238.7760	254.7710	284.6294	(64)

Total per year (kWh/year) = Sum(64)m = 2889.3735 (64)
12Total per year (kWh/year) 2889 (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

120.6871	107.1905	114.7998	102.8771	101.1037	92.5798	92.3259	95.0855	95.1492	104.3549	108.8680	119.6012	(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	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	147.7001	163.5251	147.7001	152.6234	147.7001	152.6234	147.7001	147.7001	152.6234	147.7001	152.6234	147.7001	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	292.8319	295.8706	288.2132	271.9116	251.3337	231.9934	219.0729	216.0342	223.6916	239.9932	260.5711	279.9114	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	(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)													
	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	(71)
Water heating gains (Table 5)													

	162.2139	159.5097	154.3009	142.8848	135.8921	128.5830	124.0939	127.8030	132.1517	140.2620	151.2056	160.7543 (72)
Total internal gains	669.0030	685.1626	656.4713	633.6770	601.1831	579.4570	557.1240	557.7945	574.7239	594.2124	630.6573	654.6229 (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	11.9000	10.6334	0.7600	0.7000	0.7700	46.6513 (74)
East	7.1000	19.6403	0.7600	0.7000	0.7700	51.4103 (76)
South	11.8000	46.7521	0.7600	0.7000	0.7700	203.3891 (78)
West	4.7000	19.6403	0.7600	0.7000	0.7700	34.0322 (80)

Solar gains	335.4829	589.3957	851.0636	1124.3506	1319.5245	1335.4853	1277.0078	1128.1345	945.5252	663.7336	405.1726	284.9015 (83)
Total gains	1004.4860	1274.5583	1507.5350	1758.0275	1920.7075	1914.9423	1834.1318	1685.9290	1520.2491	1257.9460	1035.8299	939.5244 (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	66.1480	66.2048	66.2607	66.5243	66.5738	66.8054	66.8054	66.8485	66.7160	66.5738	66.4737	66.3693	
alpha	5.4099	5.4137	5.4174	5.4350	5.4383	5.4537	5.4537	5.4566	5.4477	5.4383	5.4316	5.4246	
util living area	0.9948	0.9818	0.9452	0.8380	0.6605	0.4718	0.3411	0.3871	0.6248	0.9059	0.9860	0.9963	(86)
Living	19.8817	20.1528	20.4756	20.7943	20.9513	20.9933	20.9991	20.9982	20.9724	20.7230	20.2273	19.8256	
Non living	18.6819	19.0244	19.4211	19.7855	19.9378	19.9726	19.9756	19.9759	19.9592	19.7213	19.1245	18.6126	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	6	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	25	10	0	0	0	0	0	0	0	0	0	31	
MIT	20.4892	20.2840	20.4756	20.7943	20.9513	20.9933	20.9991	20.9982	20.9724	20.7230	20.2273	20.3348	(87)
Th 2	19.9667	19.9675	19.9683	19.9719	19.9726	19.9758	19.9758	19.9764	19.9746	19.9726	19.9712	19.9698	(88)
util rest of house	0.9930	0.9759	0.9284	0.7975	0.5981	0.3983	0.2621	0.3017	0.5414	0.8701	0.9804	0.9950	(89)
MIT 2	19.5094	19.2126	19.4211	19.7855	19.9378	19.9726	19.9756	19.9759	19.9592	19.7213	19.1245	19.3708	(90)
Living area fraction										fLA = Living area / (4) =		0.1429	(91)
MIT	19.6493	19.3656	19.5718	19.9296	20.0826	20.1184	20.1218	20.1219	20.1040	19.8644	19.2821	19.5085	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6493	19.3656	19.5718	19.9296	20.0826	20.1184	20.1218	20.1219	20.1040	19.8644	19.2821	19.5085	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9923	0.9714	0.9206	0.7956	0.6050	0.4087	0.2734	0.3139	0.5524	0.8656	0.9752	0.9942	(94)
Useful gains	996.7207	1238.1419	1387.8249	1398.7507	1162.0430	782.6114	501.4514	529.2764	839.7163	1088.8882	1010.1180	934.1211	(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	2208.6214	2079.6776	1877.7014	1578.0804	1198.4547	786.2333	501.7616	529.9341	856.5561	1324.5356	1744.2934	2195.3996	(97)
Space heating kWh	901.6541	565.5119	364.4682	129.1174	27.0903	0.0000	0.0000	0.0000	0.0000	175.3217	528.6063	938.3912	(98a)
Space heating requirement - total per year (kWh/year)												3630.1611	
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	901.6541	565.5119	364.4682	129.1174	27.0903	0.0000	0.0000	0.0000	0.0000	175.3217	528.6063	938.3912	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3630.1611	
Space heating per m2											(98c) / (4) =	28.8108	(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 %) 294.4427 (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	901.6541	565.5119	364.4682	129.1174	27.0903	0.0000	0.0000	0.0000	0.0000	175.3217	528.6063	938.3912	(98)
Space heating efficiency (main heating system 1)	294.4427	294.4427	294.4427	294.4427	294.4427	0.0000	0.0000	0.0000	0.0000	294.4427	294.4427	294.4427	(210)
Space heating fuel (main heating system)	306.2240	192.0618	123.7824	43.8514	9.2005	0.0000	0.0000	0.0000	0.0000	59.5436	179.5277	318.7008	(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												
	287.8954	254.5694	270.1894	236.7531	228.9981	205.7838	202.5984	210.8980	213.5115	238.7760	254.7710	284.6294 (64)
Efficiency of water heater												162.1807 (216)
(217)m	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807 (217)
Fuel for water heating, kWh/month												
	177.5152	156.9665	166.5977	145.9810	141.1993	126.8855	124.9214	130.0389	131.6504	147.2284	157.0908	175.5014 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	39.9803	32.0737	28.8788	21.1579	16.3429	13.3523	14.9086	19.3787	25.1711	33.0258	37.3026	41.0915 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1232.8922 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	162.1807
Water heating fuel used	1781.5767 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	322.6643 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	3337.1332 (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	1232.8922	0.1575	194.2232	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1781.5767	0.1410	251.1214	(264)
Space and water heating			445.3446	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	322.6643	0.1443	46.5704	(268)
Total CO2, kg/year			491.9150	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.9000	(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	1232.8922	1.5831	1951.8438	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1781.5767	1.5212	2710.1376	(278)
Space and water heating			4661.9813	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	322.6643	1.5338	494.9133	(282)
Total Primary energy kWh/year			5156.8946	(286)
Dwelling Primary energy Rate (DPER)			40.9300	(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	70.0000 (1b)	x	2.4000 (2b)	=	168.0000 (1b)	-
First floor	56.0000 (1c)	x	2.4000 (2c)	=	134.4000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	302.4000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1323 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3823 (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) =	0.3249 (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	0.4143	0.4062	0.3980	0.3574	0.3493	0.3087	0.3087	0.3006	0.3249	0.3493	0.3656	0.3818	(22b)
Effective ac	0.5858	0.5825	0.5792	0.5639	0.5610	0.5476	0.5476	0.5452	0.5528	0.5610	0.5668	0.5729	(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 Opening Type (Uw = 1.20)			31.5000	1.1450	36.0687			(27)
Heatloss Floor 1			70.0000	0.1300	9.1000			(28a)
External Wall 1	172.0000	31.5000	140.5000	0.1800	25.2900			(29a)
External Roof 1	14.0000		14.0000	0.1100	1.5400			(30)
External Roof 2	56.0000		56.0000	0.1100	6.1600			(30)
Total net area of external elements Aum(A, m2)			312.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.1587			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			271.9444 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	40.0000	0.1600	6.4000
E6 Intermediate floor within a dwelling	32.0000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	19.7000	0.0500	0.9850
E3 Sill	14.3000	0.0500	0.7150
E4 Jamb	43.9000	0.0500	2.1950
E10 Eaves (insulation at ceiling level)	18.0000	0.0600	1.0800
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.0950 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	90.2537 (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	58.4600	58.1274	57.8015	56.2704	55.9840	54.6505	54.6505	54.4035	55.1641	55.9840	56.5635	57.1693	(38)
Heat transfer coeff	148.7137	148.3811	148.0552	146.5241	146.2377	144.9042	144.9042	144.6572	145.4178	146.2377	146.8172	147.4230	(39)

Average = Sum(39)m / 12 = 146.5228

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1803	1.1776	1.1750	1.1629	1.1606	1.1500	1.1500	1.1481	1.1541	1.1606	1.1652	1.1700	(40)
HLP (average)												1.1629	
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 2.8838 (42)

Hot water usage for mixer showers

	72.5718	71.4812	69.8920	66.8513	64.6073	62.1048	60.6824	62.2596	63.9886	66.6754	69.7815	72.2938 (42a)

Hot water usage for baths

	31.3315	30.8662	30.2109	29.0027	28.0980	27.0949	26.5531	27.2037	27.9122	28.9856	30.2187	31.2256 (42b)

Hot water usage for other uses

	44.1631	42.5572	40.9512	39.3453	37.7394	36.1334	36.1334	37.7394	39.3453	40.9512	42.5572	44.1631 (42c)

Average daily hot water use (litres/day) 136.1063 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.0664	144.9046	141.0541	135.1993	130.4447	125.3332	123.3689	127.2028	131.2461	136.6123	142.5573	147.6825	(44)
Energy conte	234.5010	206.3422	216.7950	185.0811	175.6037	154.1118	149.2040	157.5036	161.8395	185.3816	203.0990	231.2350	(45)
Energy content (annual)										Total = Sum(45)m =		2260.6975	
Distribution loss (46)m = 0.15 x (45)m													
	35.1752	30.9513	32.5192	27.7622	26.3405	23.1168	22.3806	23.6255	24.2759	27.8072	30.4649	34.6853	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	281.0959	248.4279	263.3899	230.1729	222.1986	199.2036	195.7989	204.0985	206.9314	231.9765	248.1909	277.8299	(62)
WWHRS	-33.1768	-29.3418	-30.7251	-25.4416	-23.7107	-20.2894	-19.0181	-20.2238	-20.9922	-24.7474	-28.0359	-32.5624	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	247.9191	219.0860	232.6648	204.7313	198.4879	178.9142	176.7809	183.8747	185.9392	207.2290	220.1550	245.2675	(64)
										Total per year (kWh/year) = Sum(64)m =		2501.0498	(64)
12Total per year (kWh/year)												2501	(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													
	115.2475	102.2773	109.3602	97.6129	95.6641	87.3156	86.8863	89.6459	89.8851	98.9153	103.6039	114.1616	(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	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	147.7001	163.5251	147.7001	152.6234	147.7001	152.6234	147.7001	147.7001	152.6234	147.7001	152.6234	147.7001	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	292.8319	295.8706	288.2132	271.9116	251.3337	231.9934	219.0729	216.0342	223.6916	239.9932	260.5711	279.9114	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	(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)													
	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	(71)
Water heating gains (Table 5)													
	154.9026	152.1984	146.9896	135.5735	128.5808	121.2717	116.7826	120.4918	124.8404	132.9507	143.8943	153.4430	(72)
Total internal gains													
	664.6917	680.8513	652.1600	629.3657	596.8718	572.1457	549.8127	550.4832	567.4126	589.9011	626.3460	650.3116	(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	10.5600	10.6334	0.6300	0.7000	0.7700	34.3169	(74)
East	6.3000	19.6403	0.6300	0.7000	0.7700	37.8146	(76)
South	10.4700	46.7521	0.6300	0.7000	0.7700	149.5958	(78)
West	4.1700	19.6403	0.6300	0.7000	0.7700	25.0297	(80)

Solar gains	246.7569	433.5174	625.9836	826.9984	970.5593	982.3008	939.2876	829.7831	695.4643	488.1955	298.0157	209.5528	(83)
Total gains	911.4487	1114.3687	1278.1437	1456.3641	1567.4311	1554.4465	1489.1004	1380.2662	1262.8768	1078.0966	924.3617	859.8644	(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	64.0026	64.1460	64.2872	64.9590	65.0862	65.6852	65.6852	65.7973	65.4532	65.0862	64.8293	64.5629	
alpha	5.2668	5.2764	5.2858	5.3306	5.3391	5.3790	5.3790	5.3865	5.3635	5.3391	5.3220	5.3042	
util living area	0.9968	0.9904	0.9729	0.9121	0.7770	0.5811	0.4256	0.4771	0.7327	0.9477	0.9919	0.9976	(86)
MIT	19.7534	19.9823	20.2844	20.6471	20.8871	20.9808	20.9970	20.9946	20.9379	20.6036	20.1082	19.7164	(87)
Th 2	19.9358	19.9379	19.9400	19.9498	19.9516	19.9602	19.9602	19.9618	19.9569	19.9516	19.9479	19.9441	(88)
util rest of house	0.9956	0.9870	0.9633	0.8830	0.7157	0.4936	0.3264	0.3721	0.6455	0.9236	0.9884	0.9967	(89)
MIT 2	18.4959	18.7883	19.1688	19.6106	19.8651	19.9506	19.9594	19.9601	19.9197	19.5728	18.9576	18.4546	(90)
Living area fraction										fLA = Living area / (4) =		0.1429	(91)
MIT	18.6755	18.9588	19.3282	19.7586	20.0111	20.0977	20.1076	20.1079	20.0651	19.7200	19.1219	18.6349	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6755	18.9588	19.3282	19.7586	20.0111	20.0977	20.1076	20.1079	20.0651	19.7200	19.1219	18.6349	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9935	0.9826	0.9560	0.8768	0.7195	0.5055	0.3406	0.3871	0.6553	0.9169	0.9845	0.9951	(94)
Useful gains	905.5539	1095.0026	1221.9647	1276.9229	1127.7205	785.8361	507.2315	534.3537	827.5533	988.4859	910.0377	855.6610	(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	2137.8340	2086.0681	1899.2784	1591.0516	1215.3984	796.6458	508.2645	536.3754	867.4339	1333.6933	1765.0269	2128.0348	(97)
Space heating kWh	916.8164	665.9960	503.9213	226.1727	65.2323	0.0000	0.0000	0.0000	0.0000	256.8343	615.5923	946.6461	(98a)
Space heating requirement - total per year (kWh/year)												4197.2114	
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	916.8164	665.9960	503.9213	226.1727	65.2323	0.0000	0.0000	0.0000	0.0000	256.8343	615.5923	946.6461	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4197.2114	
Space heating per m2										(98c) / (4) =		33.3112	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	916.8164	665.9960	503.9213	226.1727	65.2323	0.0000	0.0000	0.0000	0.0000	256.8343	615.5923	946.6461	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	993.3005	721.5558	545.9603	245.0408	70.6742	0.0000	0.0000	0.0000	0.0000	278.2604	666.9472	1025.6187	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	247.9191	219.0860	232.6648	204.7313	198.4879	178.9142	176.7809	183.8747	185.9392	207.2290	220.1550	245.2675	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.7182	86.3883	85.7454	84.2837	81.8520	79.8000	79.8000	79.8000	79.8000	84.5422	86.2379	86.7859	(217)
Fuel for water heating, kWh/month	285.8904	253.6062	271.3438	242.9075	242.4961	224.2033	221.5299	230.4194	233.0065	245.1191	255.2879	282.6122	(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	30.6892	24.6200	22.1676	16.2409	12.5449	10.2493	11.4439	14.8752	19.3215	25.3508	28.6337	31.5421	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-60.6550	-83.1566	-116.2561	-126.9780	-133.7906	-123.6817	-122.0263	-116.6195	-106.7695	-93.1608	-65.7865	-52.7097	(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	-41.8388	-87.0165	-171.1912	-254.6641	-334.4635	-335.3316	-331.4959	-281.8051	-207.9915	-123.7466	-55.6184	-33.1719	(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												4547.3580	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	79.8000
Water heating fuel used	2988.4225 (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)	247.6791 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3459.9254 (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	4409.5341 (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	4547.3580	0.2100	954.9452	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2988.4225	0.2100	627.5687	(264)
Space and water heating			1582.5139	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	247.6791	0.1443	35.7477	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1201.5903	0.1352	-162.4665	
PV Unit electricity exported	-2258.3350	0.1262	-284.9425	
Total			-447.4090	(269)
Total CO2, kg/year			1182.7819	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3900	(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	4547.3580	1.1300	5138.5145	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2988.4225	1.1300	3376.9174	(278)
Space and water heating			8515.4319	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	247.6791	1.5338	379.8985	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1201.5903	1.4997	-1802.0807	
PV Unit electricity exported	-2258.3350	0.4632	-1045.9621	
Total			-2848.0428	(283)
Total Primary energy kWh/year			6177.3884	(286)
Target Primary Energy Rate (TPER)			49.0300	(287)

Full SAP Calculation Printout

Property Reference	House Type U	Issued on Date	05/10/2023
Assessment Reference	Plot 22	Prop Type Ref	
Property			

SAP Rating	81 B	DER	4.02	TER	11.17
Environmental	96 A	% DER < TER			64.01
CO_2 Emissions (t/year)	0.48	DFEE	37.60	TFEE	42.34
Compliance Check	See BREL	% DFEE < TFEE			11.21
% DPER < TPER	27.96	DPER	42.13	TPER	58.48

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	46.0000 (1b)	x	2.4000 (2b)	=	110.4000 (1b)	-
First floor	48.0000 (1c)	x	2.4000 (2c)	=	115.2000 (1c)	-
Second floor	36.0000 (1d)	x	2.4000 (2d)	=	86.4000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	130.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	312.0000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0321	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2321	(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) =	0.1972	(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	0.2515	0.2466	0.2416	0.2170	0.2120	0.1874	0.1874	0.1825	0.1972	0.2120	0.2219	0.2318	(22b)
Effective ac	0.5316	0.5304	0.5292	0.5235	0.5225	0.5176	0.5176	0.5166	0.5195	0.5225	0.5246	0.5269	(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	
Opening Type 1 (Uw = 1.20)			31.0000	1.1450	35.4962			(27)
Heatloss Floor 1			46.0000	0.1200	5.5200	110.0000	5060.0000	(28a)
External Wall 1	182.0000	31.0000	151.0000	0.1900	28.6900	190.0000	28690.0000	(29a)
External Roof 1	46.0000		46.0000	0.1500	6.9000	9.0000	414.0000	(30)
External Roof 2	2.0000		2.0000	0.1500	0.3000	9.0000	18.0000	(30)
Total net area of external elements Aum(A, m2)			276.0000					(31)

Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 76.9062 (33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 34182.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 262.9385 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	46.0000	0.0670	3.0820
E6 Intermediate floor within a dwelling	66.0000	0.0020	0.1320
E16 Corner (normal)	28.8000	0.0410	1.1808
E2 Other lintels (including other steel lintels)	25.0000	0.0240	0.6000
E3 Sill	20.0000	0.0190	0.3800
E4 Jamb	60.0000	0.0140	0.8400
E10 Eaves (insulation at ceiling level)	20.0000	0.0460	0.9200
E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5308 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 84.4370 (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	54.7359	54.6094	54.4855	53.9034	53.7945	53.2876	53.2876	53.1937	53.4828	53.7945	54.0148	54.2452	(38)
Heat transfer coeff	139.1728	139.0464	138.9225	138.3404	138.2315	137.7245	137.7245	137.6307	137.9198	138.2315	138.4518	138.6821	(39)

Average = Sum(39)m / 12 = 138.3399

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0706	1.0696	1.0686	1.0642	1.0633	1.0594	1.0594	1.0587	1.0609	1.0633	1.0650	1.0668	(40)
HLP (average)												1.0642	
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 2.8950 (42)
Hot water usage for mixer showers

72.7593	71.6659	70.0725	67.0240	64.7742	62.2653	60.8392	62.4205	64.1538	66.8477	69.9617	72.4805	(42a)

Hot water usage for baths

31.4121	30.9456	30.2886	29.0773	28.1703	27.1646	26.6214	27.2737	27.9840	29.0602	30.2964	31.3059	(42b)

Hot water usage for other uses

44.2776	42.6675	41.0574	39.4473	37.8372	36.2271	36.2271	37.8372	39.4473	41.0574	42.6675	44.2776	(42c)

Average daily hot water use (litres/day) 136.4580 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.4490	145.2790	141.4186	135.5486	130.7817	125.6570	123.6877	127.5314	131.5852	136.9653	142.9256	148.0640	(44)
Energy conte	235.1069	206.8753	217.3551	185.5593	176.0573	154.5099	149.5895	157.9105	162.2577	185.8606	203.6238	231.8325	(45)

Energy content (annual) Total = Sum(45)m = 2266.5384

Distribution loss (46)m = 0.15 x (45)m	35.2660	31.0313	32.6033	27.8339	26.4086	23.1765	22.4384	23.6866	24.3387	27.8791	30.5436	34.7749	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

288.5013	255.1025	270.7495	237.2313	229.4517	206.1819	202.9839	211.3049	213.9297	239.2550	255.2958	285.2269	(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

288.5013	255.1025	270.7495	237.2313	229.4517	206.1819	202.9839	211.3049	213.9297	239.2550	255.2958	285.2269	(64)

Total per year (kWh/year) = Sum(64)m = 2895.2144 (64)
12Total per year (kWh/year) 2895 (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

120.8886	107.3678	114.9861	103.0361	101.2546	92.7122	92.4540	95.2208	95.2883	104.5142	109.0425	119.7998	(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	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	150.1658	166.2550	150.1658	155.1714	150.1658	155.1714	150.1658	150.1658	155.1714	150.1658	155.1714	150.1658	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.7205	300.8100	293.0247	276.4510	255.5295	235.8663	222.7301	219.6407	227.4259	243.9997	264.9211	284.5843	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	(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)

	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996 (71)
Water heating gains (Table 5)												
	162.4846	159.7735	154.5512	143.1056	136.0949	128.7669	124.2662	127.9849	132.3448	140.4760	151.4479	161.0213 (72)
Total internal gains												
	676.7959	693.2633	664.1666	641.1528	608.2151	586.2294	563.5870	564.2163	581.3670	601.0664	637.9653	662.1963 (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	11.5000	10.6334	0.7600	0.7000	0.7700	45.0832 (74)
East	8.0000	19.6403	0.7600	0.7000	0.7700	57.9272 (76)
West	11.5000	19.6403	0.7600	0.7000	0.7700	83.2703 (80)

Solar gains	186.2806	362.3684	601.2826	898.5751	1129.8218	1171.4153	1108.9909	931.8330	705.0675	430.3067	231.6725	153.6975 (83)
Total gains	863.0765	1055.6317	1265.4492	1539.7279	1738.0369	1757.6447	1672.5779	1496.0493	1286.4345	1031.3731	869.6378	815.8937 (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	68.2245	68.2866	68.3475	68.6350	68.6891	68.9420	68.9420	68.9890	68.8444	68.6891	68.5798	68.4659	
alpha	5.5483	5.5524	5.5565	5.5757	5.5793	5.5961	5.5961	5.5993	5.5896	5.5793	5.5720	5.5644	
util living area													
	0.9974	0.9918	0.9705	0.8810	0.6982	0.4962	0.3615	0.4212	0.6984	0.9501	0.9934	0.9981	(86)
Living	19.8244	20.0425	20.3682	20.7447	20.9420	20.9925	20.9989	20.9976	20.9572	20.6318	20.1471	19.7817	
Non living	18.6556	18.9338	19.3425	19.7885	19.9877	20.0304	20.0338	20.0340	20.0070	19.6733	19.0714	18.6032	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	5	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	26	1	0	0	0	0	0	0	0	0	0	31	
MIT	20.4416	20.0573	20.3682	20.7447	20.9420	20.9925	20.9989	20.9976	20.9572	20.6318	20.1471	20.3100	(87)
Th 2	20.0249	20.0257	20.0265	20.0302	20.0309	20.0341	20.0341	20.0347	20.0329	20.0309	20.0295	20.0281	(88)
util rest of house													
	0.9965	0.9890	0.9608	0.8479	0.6385	0.4237	0.2826	0.3339	0.6166	0.9281	0.9907	0.9974	(89)
MIT 2	19.5180	18.9556	19.3425	19.7885	19.9877	20.0304	20.0338	20.0340	20.0070	19.6733	19.0714	19.3992	(90)
Living area fraction									fLA = Living area / (4) =			0.1385	(91)
MIT	19.6459	19.1081	19.4845	19.9209	20.1198	20.1636	20.1674	20.1674	20.1386	19.8060	19.2203	19.5253	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6459	19.1081	19.4845	19.9209	20.1198	20.1636	20.1674	20.1674	20.1386	19.8060	19.2203	19.5253	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9961	0.9854	0.9538	0.8437	0.6442	0.4336	0.2935	0.3460	0.6261	0.9217	0.9875	0.9970	(94)
Useful gains	859.6949	1040.2321	1207.0471	1299.0966	1119.6781	762.0754	490.9590	517.6094	805.4356	950.5773	858.7402	813.4477	(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													
	2135.7316	1975.5866	1803.8409	1524.6405	1163.8819	766.2415	491.3248	518.5081	832.8425	1272.5629	1678.0809	2125.3425	(97)
Space heating kWh													
	949.3713	628.5582	444.0146	162.3916	32.8876	0.0000	0.0000	0.0000	0.0000	239.5574	589.9253	976.0497	(98a)
Space heating requirement - total per year (kWh/year)												4022.7557	
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													
	949.3713	628.5582	444.0146	162.3916	32.8876	0.0000	0.0000	0.0000	0.0000	239.5574	589.9253	976.0497	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4022.7557	
Space heating per m2											(98c) / (4) =	30.9443	(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 %)	291.8585 (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													
	949.3713	628.5582	444.0146	162.3916	32.8876	0.0000	0.0000	0.0000	0.0000	239.5574	589.9253	976.0497	(98)
Space heating efficiency (main heating system 1)													
	291.8585	291.8585	291.8585	291.8585	291.8585	0.0000	0.0000	0.0000	0.0000	291.8585	291.8585	291.8585	(210)
Space heating fuel (main heating system)													
	325.2849	215.3641	152.1335	55.6405	11.2683	0.0000	0.0000	0.0000	0.0000	82.0800	202.1272	334.4257	(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
288.5013 255.1025 270.7495 237.2313 229.4517 206.1819 202.9839 211.3049 213.9297 239.2550 255.2958 285.2269 (64)
Efficiency of water heater 157.6656 (216)
(217)m 157.6656 157.6656 157.6656 157.6656 157.6656 157.6656 157.6656 157.6656 157.6656 157.6656 157.6656 157.6656 (217)
Fuel for water heating, kWh/month
182.9831 161.7998 171.7239 150.4649 145.5307 130.7717 128.7433 134.0210 135.6857 151.7484 161.9223 180.9063 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (231)
Lighting 40.7081 32.6575 29.4045 21.5430 16.6404 13.5954 15.1799 19.7315 25.6292 33.6269 37.9815 41.8395 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235b)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235d)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235d)
Annual totals kWh/year
Space heating fuel - main system 1 1378.3242 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 157.6656
Water heating fuel used 1836.3010 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
Total electricity for the above, kWh/year 0.0000 (231)
Electricity for lighting (calculated in Appendix L) 328.5373 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (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 3543.1625 (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	1378.3242	0.1570	216.3956	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1836.3010	0.1410	258.8374	(264)
Space and water heating			475.2330	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	328.5373	0.1443	47.4181	(268)
Total CO2, kg/year			522.6511	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0200	(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	1378.3242	1.5812	2179.3940	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1836.3010	1.5212	2793.3930	(278)
Space and water heating			4972.7869	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	328.5373	1.5338	503.9215	(282)
Total Primary energy kWh/year			5476.7084	(286)
Dwelling Primary energy Rate (DPER)			42.1300	(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	46.0000 (1b)	x	2.4000 (2b)	=	110.4000 (1b)	-
First floor	48.0000 (1c)	x	2.4000 (2c)	=	115.2000 (1c)	-
Second floor	36.0000 (1d)	x	2.4000 (2d)	=	86.4000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	130.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	312.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1282	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3782	(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) =	0.3215	(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	0.4099	0.4018	0.3938	0.3536	0.3456	0.3054	0.3054	0.2974	0.3215	0.3456	0.3617	0.3777	(22b)
Effective ac	0.5840	0.5807	0.5775	0.5625	0.5597	0.5466	0.5466	0.5442	0.5517	0.5597	0.5654	0.5713	(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 Opening Type (Uw = 1.20)			31.0000	1.1450	35.4962			(27)
Heatloss Floor 1			46.0000	0.1300	5.9800			(28a)
External Wall 1	182.0000	31.0000	151.0000	0.1800	27.1800			(29a)
External Roof 1	46.0000		46.0000	0.1100	5.0600			(30)
External Roof 2	2.0000		2.0000	0.1100	0.2200			(30)
Total net area of external elements Aum(A, m2)			276.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		73.9362			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 262.9385 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	46.0000	0.1600	7.3600
E6 Intermediate floor within a dwelling	66.0000	0.0000	0.0000
E16 Corner (normal)	28.8000	0.0900	2.5920
E2 Other lintels (including other steel lintels)	25.0000	0.0500	1.2500
E3 Sill	20.0000	0.0500	1.0000
E4 Jamb	60.0000	0.0500	3.0000
E10 Eaves (insulation at ceiling level)	20.0000	0.0600	1.2000
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		17.1220	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	91.0582	(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	60.1287	59.7929	59.4637	57.9175	57.6282	56.2815	56.2815	56.0321	56.8002	57.6282	58.2134	58.8253	(38)
Heat transfer coeff	151.1869	150.8511	150.5219	148.9757	148.6864	147.3397	147.3397	147.0903	147.8584	148.6864	149.2716	149.8834	(39)
Average = Sum(39)m / 12 =												148.9743	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1630	1.1604	1.1579	1.1460	1.1437	1.1334	1.1334	1.1315	1.1374	1.1437	1.1482	1.1529	(40)
HLP (average)												1.1460	
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 2.8950 (42)

Hot water usage for mixer showers

	72.7593	71.6659	70.0725	67.0240	64.7742	62.2653	60.8392	62.4205	64.1538	66.8477	69.9617	72.4805 (42a)

Hot water usage for baths

	31.4121	30.9456	30.2886	29.0773	28.1703	27.1646	26.6214	27.2737	27.9840	29.0602	30.2964	31.3059 (42b)

Hot water usage for other uses

	44.2776	42.6675	41.0574	39.4473	37.8372	36.2271	36.2271	37.8372	39.4473	41.0574	42.6675	44.2776 (42c)

Average daily hot water use (litres/day) 136.4580 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.4490	145.2790	141.4186	135.5486	130.7817	125.6570	123.6877	127.5314	131.5852	136.9653	142.9256	148.0640	(44)
Energy conte	235.1069	206.8753	217.3551	185.5593	176.0573	154.5099	149.5895	157.9105	162.2577	185.8606	203.6238	231.8325	(45)
Energy content (annual)										Total = Sum(45)m =		2266.5384	
Distribution loss (46)m = 0.15 x (45)m													
	35.2660	31.0313	32.6033	27.8339	26.4086	23.1765	22.4384	23.6866	24.3387	27.8791	30.5436	34.7749	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	281.7018	248.9610	263.9500	230.6511	222.6523	199.6018	196.1844	204.5054	207.3495	232.4555	248.7156	278.4274	(62)
WWHRS	-33.2625	-29.4176	-30.8045	-25.5073	-23.7719	-20.3418	-19.0672	-20.2760	-21.0464	-24.8114	-28.1083	-32.6465	(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													
	248.4393	219.5434	233.1455	205.1438	198.8804	179.2600	177.1173	184.2294	186.3031	207.6441	220.6074	245.7808	(64)
										Total per year (kWh/year) = Sum(64)m =		2506.0944	(64)
12Total per year (kWh/year)												2506	(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													
	115.4490	102.4546	109.5465	97.7719	95.8150	87.4480	87.0144	89.7812	90.0242	99.0746	103.7784	114.3602	(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	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	150.1658	166.2550	150.1658	155.1714	150.1658	155.1714	150.1658	150.1658	155.1714	150.1658	155.1714	150.1658	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	297.7205	300.8100	293.0247	276.4510	255.5295	235.8663	222.7301	219.6407	227.4259	243.9997	264.9211	284.5843	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	(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)													
	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	(71)
Water heating gains (Table 5)													
	155.1733	152.4622	147.2399	135.7943	128.7836	121.4556	116.9549	120.6736	125.0335	133.1647	144.1366	153.7100	(72)
Total internal gains													
	672.4846	688.9520	659.8553	636.8415	603.9038	578.9181	556.2757	556.9050	574.0557	596.7551	633.6540	657.8850	(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	11.5000	10.6334	0.6300	0.7000	0.7700	37.3716	(74)
East	8.0000	19.6403	0.6300	0.7000	0.7700	48.0186	(76)
West	11.5000	19.6403	0.6300	0.7000	0.7700	69.0267	(80)

Solar gains	154.4168	300.3843	498.4316	744.8715	936.5628	971.0416	919.2951	772.4405	584.4639	356.7016	192.0443	127.4071	(83)
Total gains	826.9014	989.3364	1158.2869	1381.7130	1540.4666	1549.9597	1475.5708	1329.3455	1158.5195	953.4567	825.6983	785.2921	(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	62.8031	62.9429	63.0805	63.7352	63.8592	64.4429	64.4429	64.5522	64.2168	63.8592	63.6089	63.3492	
alpha	5.1869	5.1962	5.2054	5.2490	5.2573	5.2962	5.2962	5.3035	5.2811	5.2573	5.2406	5.2233	
util living area	0.9979	0.9944	0.9823	0.9286	0.7916	0.5905	0.4362	0.5019	0.7830	0.9683	0.9952	0.9984	(86)
MIT	19.6566	19.8575	20.1735	20.5882	20.8705	20.9779	20.9963	20.9925	20.9102	20.5058	20.0070	19.6271	(87)
Th 2	19.9497	19.9518	19.9539	19.9635	19.9653	19.9737	19.9737	19.9752	19.9704	19.9653	19.9616	19.9578	(88)
util rest of house	0.9972	0.9924	0.9759	0.9041	0.7328	0.5036	0.3362	0.3938	0.7004	0.9525	0.9931	0.9979	(89)
MIT 2	18.3864	18.6442	19.0456	19.5576	19.8634	19.9622	19.9726	19.9728	19.9128	19.4724	18.8433	18.3544	(90)
Living area fraction										fLA = Living area / (4) =		0.1385	(91)
MIT	18.5623	18.8122	19.2018	19.7003	20.0028	20.1029	20.1143	20.1140	20.0509	19.6155	19.0044	18.5306	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5623	18.8122	19.2018	19.7003	20.0028	20.1029	20.1143	20.1140	20.0509	19.6155	19.0044	18.5306	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9957	0.9893	0.9696	0.8965	0.7351	0.5149	0.3500	0.4088	0.7075	0.9454	0.9903	0.9967	(94)
Useful gains	823.3572	978.7311	1123.1000	1238.7580	1132.4115	798.0765	516.4892	543.4080	819.6945	901.3675	817.6686	782.6876	(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	2156.2675	2098.6646	1911.8922	1608.9760	1234.5166	810.7920	517.8026	546.2983	879.8838	1340.4841	1776.9871	2147.9188	(97)
Space heating kWh	991.6853	752.5953	586.8614	266.5570	75.9662	0.0000	0.0000	0.0000	0.0000	326.7027	690.7094	1015.7320	(98a)
Space heating requirement - total per year (kWh/year)												4706.8092	
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	991.6853	752.5953	586.8614	266.5570	75.9662	0.0000	0.0000	0.0000	0.0000	326.7027	690.7094	1015.7320	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4706.8092	
Space heating per m2											(98c) / (4) =	36.2062	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	991.6853	752.5953	586.8614	266.5570	75.9662	0.0000	0.0000	0.0000	0.0000	326.7027	690.7094	1015.7320	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	1074.4153	815.3795	635.8195	288.7941	82.3036	0.0000	0.0000	0.0000	0.0000	353.9575	748.3308	1100.4680	(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	248.4393	219.5434	233.1455	205.1438	198.8804	179.2600	177.1173	184.2294	186.3031	207.6441	220.6074	245.7808	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.8380	86.5944	86.0410	84.6481	82.0999	79.8000	79.8000	79.8000	79.8000	85.0716	86.4400	86.8907	(217)
Fuel for water heating, kWh/month	286.0952	253.5306	270.9703	242.3490	242.2420	224.6366	221.9514	230.8639	233.4626	244.0815	255.2143	282.8620	(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	31.2015	25.0310	22.5376	16.5120	12.7544	10.4204	11.6350	15.1236	19.6440	25.7740	29.1117	32.0687	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-44.2558	-63.0359	-91.5138	-103.9189	-112.8644	-105.5578	-104.1712	-97.8987	-87.0365	-72.4556	-48.8496	-38.1799	(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	-23.0973	-48.7921	-97.3802	-146.8744	-194.8454	-196.0795	-193.8577	-163.9232	-119.8064	-70.0835	-30.9308	-18.2566	(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												5099.4683	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2988.2595	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	251.8139	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2273.6652	(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	6151.8765	(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	5099.4683	0.2100	1070.8883	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2988.2595	0.2100	627.5345	(264)
Space and water heating			1698.4228	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	251.8139	0.1443	36.3445	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-969.7381	0.1344	-130.3262	
PV Unit electricity exported	-1303.9271	0.1258	-163.9842	
Total			-294.3104	(269)
Total CO2, kg/year			1452.3862	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1700	(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	5099.4683	1.1300	5762.3992	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2988.2595	1.1300	3376.7333	(278)
Space and water heating			9139.1324	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	251.8139	1.5338	386.2406	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-969.7381	1.4967	-1451.3913	
PV Unit electricity exported	-1303.9271	0.4616	-601.9255	
Total			-2053.3168	(283)
Total Primary energy kWh/year			7602.1570	(286)
Target Primary Energy Rate (TPER)			58.4800	(287)

Full SAP Calculation Printout

Property Reference	House Type U	Issued on Date	05/10/2023
Assessment Reference	Plot 23	Prop Type Ref	
Property			

SAP Rating	81 B	DER	4.43	TER	12.62
Environmental	96 A	% DER < TER			64.90
CO_2 Emissions (t/year)	0.4	DFEE	37.97	TFEE	44.88
Compliance Check	See BREL	% DFEE < TFEE			15.40
% DPER < TPER	29.84	DPER	46.37	TPER	66.09

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	40.0000 (1b)	x	2.4000 (2b)	=	96.0000 (1b)	-
First floor	37.0000 (1c)	x	2.4000 (2c)	=	88.8000 (1c)	-
Second floor	23.0000 (1d)	x	2.4000 (2d)	=	55.2000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.0000	(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	1 * 10	=	10.0000 (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) =	10.0000 / (5)	=	0.0417 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			4.0000 (17)
Infiltration rate			0.2417 (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)	=	0.2054 (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	0.2619	0.2568	0.2516	0.2260	0.2208	0.1951	0.1951	0.1900	0.2054	0.2208	0.2311	0.2414	(22b)
Effective ac	0.5343	0.5330	0.5317	0.5255	0.5244	0.5190	0.5190	0.5181	0.5211	0.5244	0.5267	0.5291	(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	
Opening Type 1 (Uw = 1.20)			23.7000	1.1450	27.1374			(27)
Heatloss Floor 1			76.0000	0.1200	9.1200	110.0000	8360.0000	(28a)
External Wall 1	182.0000	23.7000	158.3000	0.1900	30.0770	190.0000	30077.0000	(29a)
External Roof 1	23.0000		23.0000	0.1500	3.4500	9.0000	207.0000	(30)
External Roof 2	2.0000		2.0000	0.1500	0.3000	9.0000	18.0000	(30)
Total net area of external elements Aum(A, m2)			283.0000					(31)

Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 70.0844 (33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 38662.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 386.6200 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	46.0000	0.0670	3.0820
E6 Intermediate floor within a dwelling	66.0000	0.0020	0.1320
E16 Corner (normal)	28.8000	0.0410	1.1808
E2 Other lintels (including other steel lintels)	25.0000	0.0240	0.6000
E3 Sill	20.0000	0.0190	0.3800
E4 Jamb	60.0000	0.0140	0.8400
E10 Eaves (insulation at ceiling level)	20.0000	0.0460	0.9200
E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5308 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 77.6152 (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	42.3164	42.2109	42.1075	41.6219	41.5310	41.1080	41.1080	41.0297	41.2710	41.5310	41.7148	41.9070	(38)
Heat transfer coeff	119.9316	119.8261	119.7227	119.2371	119.1462	118.7232	118.7232	118.6449	118.8862	119.1462	119.3300	119.5222	(39)

Average = Sum(39)m / 12 = 119.2366

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1993	1.1983	1.1972	1.1924	1.1915	1.1872	1.1872	1.1864	1.1889	1.1915	1.1933	1.1952	(40)
HLP (average)												1.1924	
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 2.7395 (42)
Hot water usage for mixer showers

70.1526	69.0984	67.5621	64.6228	62.4536	60.0345	58.6596	60.1842	61.8555	64.4528	67.4553	69.8838	(42a)

Hot water usage for baths

30.2911	29.8413	29.2078	28.0397	27.1651	26.1952	25.6714	26.3005	26.9854	28.0232	29.2153	30.1887	(42b)

Hot water usage for other uses

42.6855	41.1333	39.5811	38.0289	36.4767	34.9245	34.9245	36.4767	38.0289	39.5811	41.1333	42.6855	(42c)

Average daily hot water use (litres/day) 131.5680 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.1293	140.0729	136.3510	130.6913	126.0953	121.1543	119.2554	122.9613	126.8698	132.0570	137.8038	142.7581	(44)
Energy conte	226.6818	199.4620	209.5664	178.9099	169.7486	148.9733	144.2291	152.2518	156.4431	179.2001	196.3268	223.5246	(45)

Energy content (annual) Total = Sum(45)m = 2185.3176

Distribution loss (46)m = 0.15 x (45)m	34.0023	29.9193	31.4350	26.8365	25.4623	22.3460	21.6344	22.8378	23.4665	26.8800	29.4490	33.5287	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

280.0762	247.6892	262.9608	230.5819	223.1430	200.6453	197.6235	205.6462	208.1151	232.5945	247.9988	276.9190	(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 -0.6582	-1.4771	-3.1313	-5.0436	-6.9836	-7.1503	-7.0585	-5.7708	-4.0236	-2.1928	-0.9014	-0.5120	(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

279.4179	246.2121	259.8295	225.5383	216.1594	193.4950	190.5650	199.8755	204.0915	230.4018	247.0974	276.4070	(64)

Total per year (kWh/year) = Sum(64)m = 2769.0903 (64)
12Total per year (kWh/year) 2769 (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

118.0872	104.9029	112.3963	100.8251	99.1569	90.8712	90.6717	93.3392	93.3549	102.2996	106.6163	117.0375	(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	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.2879	143.1402	129.2879	133.5975	129.2879	133.5975	129.2879	129.2879	133.5975	129.2879	133.5975	129.2879	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	256.3278	258.9876	252.2848	238.0153	220.0027	203.0733	191.7634	189.1036	195.8064	210.0759	228.0885	245.0179	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	(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)													

	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	(71)
Water heating gains (Table 5)												
	158.7194	156.1055	151.0703	140.0349	133.2754	126.2100	121.8706	125.4560	129.6596	137.4994	148.0782	157.3084 (72)
Total internal gains												
	608.4279	622.3262	596.7360	575.7407	546.6589	526.9737	507.0148	507.9403	523.1564	540.9561	573.8571	595.7071 (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	
East	8.3000	19.6403	0.7600	0.7000	0.7700	60.0994	(76)
South	6.2000	46.7521	0.7600	0.7000	0.7700	106.8655	(78)
West	9.2000	19.6403	0.7600	0.7000	0.7700	66.6162	(80)

Solar gains	233.5811	422.9008	631.1695	847.3483	992.2262	999.6208	958.0021	850.5994	707.6747	482.9071	284.6715	196.5464	(83)
Total gains	842.0090	1045.2270	1227.9055	1423.0889	1538.8851	1526.5945	1465.0169	1358.5398	1230.8311	1023.8632	858.5286	792.2535	(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	89.5464	89.6253	89.7027	90.0680	90.1367	90.4578	90.4578	90.5175	90.3338	90.1367	89.9978	89.8532	
alpha	6.9698	6.9750	6.9802	7.0045	7.0091	7.0305	7.0305	7.0345	7.0223	7.0091	6.9999	6.9902	
util living area													
	0.9986	0.9936	0.9721	0.8810	0.6983	0.4959	0.3564	0.4013	0.6531	0.9418	0.9952	0.9991	(86)
Living	20.1356	20.3373	20.5965	20.8593	20.9751	20.9979	20.9998	20.9996	20.9877	20.7953	20.4012	20.0946	
Non living	18.9343	19.1913	19.5124	19.8091	19.9120	19.9295	19.9302	19.9308	19.9237	19.7533	19.2771	18.8845	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5578	20.3373	20.5965	20.8593	20.9751	20.9979	20.9998	20.9996	20.9877	20.7953	20.4012	20.2213	(87)
Th 2	19.9205	19.9214	19.9222	19.9261	19.9268	19.9302	19.9302	19.9309	19.9289	19.9268	19.9254	19.9238	(88)
util rest of house													
	0.9979	0.9904	0.9592	0.8378	0.6269	0.4140	0.2699	0.3083	0.5586	0.9079	0.9922	0.9986	(89)
MIT 2	19.5274	19.1913	19.5124	19.8091	19.9120	19.9295	19.9302	19.9308	19.9237	19.7533	19.2771	19.0718	(90)
Living area fraction									fLA = Living area / (4) =			0.2000	(91)
MIT	19.7335	19.4205	19.7292	20.0192	20.1246	20.1432	20.1441	20.1445	20.1365	19.9617	19.5019	19.3017	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7335	19.4205	19.7292	20.0192	20.1246	20.1432	20.1441	20.1445	20.1365	19.9617	19.5019	19.3017	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9977	0.9884	0.9562	0.8420	0.6405	0.4304	0.2872	0.3269	0.5775	0.9093	0.9906	0.9982	(94)
Useful gains	840.1106	1033.0853	1174.1708	1198.2454	985.7105	657.0933	420.7234	444.1566	710.7972	930.9727	850.4538	790.8451	(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													
	1850.9589	1739.9335	1583.8391	1325.8161	1003.7646	658.1042	420.7700	444.2717	717.6613	1115.4072	1479.9235	1804.9882	(97)
Space heating kWh													
	752.0711	475.0020	304.7932	91.8509	13.4323	0.0000	0.0000	0.0000	0.0000	137.2192	453.2182	754.5224	(98a)
Space heating requirement - total per year (kWh/year)												2982.1093	
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													
	752.0711	475.0020	304.7932	91.8509	13.4323	0.0000	0.0000	0.0000	0.0000	137.2192	453.2182	754.5224	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2982.1093	
Space heating per m2										(98c) / (4) =		29.8211	(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 %)	277.4043 (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													
	752.0711	475.0020	304.7932	91.8509	13.4323	0.0000	0.0000	0.0000	0.0000	137.2192	453.2182	754.5224	(98)
Space heating efficiency (main heating system 1)													
	277.4043	277.4043	277.4043	277.4043	277.4043	0.0000	0.0000	0.0000	0.0000	277.4043	277.4043	277.4043	(210)
Space heating fuel (main heating system)													
	271.1101	171.2309	109.8733	33.1108	4.8421	0.0000	0.0000	0.0000	0.0000	49.4654	163.3782	271.9937	(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												
	279.4179	246.2121	259.8295	225.5383	216.1594	193.4950	190.5650	199.8755	204.0915	230.4018	247.0974	276.4070 (64)
Efficiency of water heater												148.8191 (216)
(217)m	148.8191	148.8191	148.8191	148.8191	148.8191	148.8191	148.8191	148.8191	148.8191	148.8191	148.8191	148.8191 (217)
Fuel for water heating, kWh/month												
	187.7568	165.4439	174.5942	151.5520	145.2497	130.0203	128.0514	134.3077	137.1407	154.8200	166.0388	185.7336 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	34.5580	27.7237	24.9621	18.2883	14.1264	11.5414	12.8866	16.7505	21.7572	28.5467	32.2434	35.5185 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-7.2660	-11.5999	-18.8008	-23.7179	-28.0113	-27.0884	-26.7265	-23.9129	-19.4282	-14.1937	-8.4220	-6.1279 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-0.0165	-0.1316	-0.4954	-1.2016	-1.9384	-2.0410	-2.0149	-1.6390	-1.1352	-0.4652	-0.0820	-0.0094 (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	1075.0046 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	148.8191
Water heating fuel used	1860.7090 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	278.9028 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-226.4657 (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	2988.1507 (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	1075.0046	0.1577	169.5049	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1860.7090	0.1411	262.6249	(264)
Space and water heating			432.1298	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	278.9028	0.1443	40.2543	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-215.2955	0.1322	-28.4727	
PV Unit electricity exported	-11.1703	0.1171	-1.3078	
Total			-29.7804	(269)
Total CO2, kg/year			442.6037	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4300	(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	1075.0046	1.5837	1702.4475	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1860.7090	1.5219	2831.8227	(278)
Space and water heating			4534.2702	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	278.9028	1.5338	427.7904	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-215.2955	1.4886	-320.4967	
PV Unit electricity exported	-11.1703	0.4294	-4.7968	
Total			-325.2934	(283)
Total Primary energy kWh/year			4636.7672	(286)
Dwelling Primary energy Rate (DPER)			46.3700	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	40.0000 (1b)	x	2.4000 (2b)	=	96.0000 (1b)	-
First floor	37.0000 (1c)	x	2.4000 (2c)	=	88.8000 (1c)	-
Second floor	23.0000 (1d)	x	2.4000 (2d)	=	55.2000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.0000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	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) =	0.1250	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3750	(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) =	0.3187	(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	0.4064	0.3984	0.3905	0.3506	0.3427	0.3028	0.3028	0.2948	0.3187	0.3427	0.3586	0.3745	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5458	0.5458	0.5435	0.5508	0.5587	0.5643	0.5701	(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 Opening Type (Uw = 1.20)			23.7000	1.1450	27.1374			(27)
Heatloss Floor 1			76.0000	0.1300	9.8800			(28a)
External Wall 1	182.0000	23.7000	158.3000	0.1800	28.4940			(29a)
External Roof 1	23.0000		23.0000	0.1100	2.5300			(30)
External Roof 2	2.0000		2.0000	0.1100	0.2200			(30)
Total net area of external elements Aum(A, m2)			283.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	68.2614			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							386.6200	(35)

List of Thermal Bridges

	Length	Psi-value	Total
E5 Ground floor (normal)	46.0000	0.1600	7.3600
E6 Intermediate floor within a dwelling	66.0000	0.0000	0.0000
E16 Corner (normal)	28.8000	0.0900	2.5920
E2 Other lintels (including other steel lintels)	25.0000	0.0500	1.2500
E3 Sill	20.0000	0.0500	1.0000
E4 Jamb	60.0000	0.0500	3.0000
E10 Eaves (insulation at ceiling level)	20.0000	0.0600	1.2000
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		17.1220	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	85.3834	(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	46.1406	45.8866	45.6376	44.4683	44.2496	43.2311	43.2311	43.0425	43.6234	44.2496	44.6921	45.1548	(38)
Heat transfer coeff													
	131.5240	131.2700	131.0211	129.8517	129.6330	128.6145	128.6145	128.4259	129.0068	129.6330	130.0755	130.5382	(39)
Average = Sum(39)m / 12 =												129.8507	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3152	1.3127	1.3102	1.2985	1.2963	1.2861	1.2861	1.2843	1.2901	1.2963	1.3008	1.3054	(40)
HLP (average)												1.2985	
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												2.7395	(42)
Hot water usage for mixer showers													
	70.1526	69.0984	67.5621	64.6228	62.4536	60.0345	58.6596	60.1842	61.8555	64.4528	67.4553	69.8838	(42a)
Hot water usage for baths													
	30.2911	29.8413	29.2078	28.0397	27.1651	26.1952	25.6714	26.3005	26.9854	28.0232	29.2153	30.1887	(42b)
Hot water usage for other uses													
	42.6855	41.1333	39.5811	38.0289	36.4767	34.9245	34.9245	36.4767	38.0289	39.5811	41.1333	42.6855	(42c)
Average daily hot water use (litres/day)												131.5680	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	143.1293	140.0729	136.3510	130.6913	126.0953	121.1543	119.2554	122.9613	126.8698	132.0570	137.8038	142.7581	(44)
Energy conte	226.6818	199.4620	209.5664	178.9099	169.7486	148.9733	144.2291	152.2518	156.4431	179.2001	196.3268	223.5246	(45)
Energy content (annual)										Total = Sum(45)m =		2185.3176	
Distribution loss (46)m = 0.15 x (45)m													
	34.0023	29.9193	31.4350	26.8365	25.4623	22.3460	21.6344	22.8378	23.4665	26.8800	29.4490	33.5287	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	273.2767	241.5477	256.1613	224.0018	216.3435	194.0651	190.8240	198.8467	201.5349	225.7950	241.4187	270.1195	(62)
WWHRS	-32.0709	-28.3637	-29.7009	-24.5935	-22.9202	-19.6130	-18.3841	-19.5496	-20.2924	-23.9225	-27.1013	-31.4769	(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													
	241.2058	213.1840	226.4604	199.4083	193.4232	174.4521	172.4399	179.2971	181.2426	201.8726	214.3174	238.6426	(64)
										Total per year (kWh/year) = Sum(64)m =		2435.9460	(64)
12Total per year (kWh/year)												2436	(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													
	112.6476	99.9897	106.9567	95.5610	93.7173	85.6071	85.2321	87.8997	88.0908	96.8600	101.3521	111.5979	(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	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	129.2879	143.1402	129.2879	133.5975	129.2879	133.5975	129.2879	129.2879	133.5975	129.2879	133.5975	129.2879	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	256.3278	258.9876	252.2848	238.0153	220.0027	203.0733	191.7634	189.1036	195.8064	210.0759	228.0885	245.0179	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	(71)
Water heating gains (Table 5)													
	151.4081	148.7942	143.7591	132.7236	125.9641	118.8987	114.5593	118.1447	122.3483	130.1881	140.7669	149.9971	(72)
Total internal gains													
	604.1167	618.0149	592.4247	571.4294	542.3476	519.6625	499.7035	500.6291	515.8451	536.6448	569.5458	591.3959	(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	
East	8.3000	19.6403	0.6300	0.7000	0.7700	49.8193	(76)
South	6.2000	46.7521	0.6300	0.7000	0.7700	88.5858	(78)
West	9.2000	19.6403	0.6300	0.7000	0.7700	55.2213	(80)

Solar gains	193.6264	350.5625	523.2063	702.4071	822.5033	828.6330	794.1333	705.1022	586.6251	400.3046	235.9777	162.9266	(83)
Total gains	797.7431	968.5774	1115.6310	1273.8365	1364.8509	1348.2955	1293.8368	1205.7312	1102.4702	936.9494	805.5235	754.3225	(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	81.6539	81.8119	81.9673	82.7054	82.8450	83.5010	83.5010	83.6236	83.2471	82.8450	82.5631	82.2705	
alpha	6.4436	6.4541	6.4645	6.5137	6.5230	6.5667	6.5667	6.5749	6.5498	6.5230	6.5042	6.4847	
util living area	0.9991	0.9965	0.9865	0.9392	0.8077	0.6010	0.4363	0.4877	0.7596	0.9696	0.9971	0.9994	(86)
MIT	19.9740	20.1578	20.4137	20.7246	20.9242	20.9905	20.9990	20.9980	20.9612	20.6769	20.2619	19.9435	(87)
Th 2	19.8289	19.8309	19.8328	19.8420	19.8437	19.8517	19.8517	19.8532	19.8486	19.8437	19.8402	19.8366	(88)
util rest of house	0.9986	0.9946	0.9794	0.9093	0.7351	0.4983	0.3231	0.3675	0.6554	0.9480	0.9953	0.9990	(89)
MIT 2	18.6569	18.8930	19.2169	19.5944	19.7943	19.8483	19.8515	19.8528	19.8307	19.5513	19.0340	18.6238	(90)
Living area fraction										fLA = Living area / (4) =		0.2000	(91)
MIT	18.9203	19.1460	19.4563	19.8205	20.0203	20.0767	20.0810	20.0818	20.0568	19.7764	19.2796	18.8877	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9203	19.1460	19.4563	19.8205	20.0203	20.0767	20.0810	20.0818	20.0568	19.7764	19.2796	18.8877	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9980	0.9930	0.9762	0.9086	0.7472	0.5189	0.3458	0.3917	0.6758	0.9463	0.9939	0.9986	(94)
Useful gains	796.1300	961.8418	1089.1200	1157.3994	1019.8764	699.6189	447.4352	472.2333	745.0313	886.6738	800.6284	753.2419	(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	1922.9177	1870.0686	1697.5451	1418.0428	1078.5856	704.3877	447.7107	472.8442	768.4639	1189.5686	1584.2623	1917.3090	(97)
Space heating kWh	838.3301	610.3284	452.6683	187.6633	43.6796	0.0000	0.0000	0.0000	0.0000	225.3537	564.2164	866.0659	(98a)
Space heating requirement - total per year (kWh/year)												3788.3057	
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	838.3301	610.3284	452.6683	187.6633	43.6796	0.0000	0.0000	0.0000	0.0000	225.3537	564.2164	866.0659	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3788.3057	
Space heating per m2											(98c) / (4) =	37.8831	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	838.3301	610.3284	452.6683	187.6633	43.6796	0.0000	0.0000	0.0000	0.0000	225.3537	564.2164	866.0659	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	908.2666	661.2442	490.4315	203.3188	47.3236	0.0000	0.0000	0.0000	0.0000	244.1535	611.2853	938.3163	(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	241.2058	213.1840	226.4604	199.4083	193.4232	174.4521	172.4399	179.2971	181.2426	201.8726	214.3174	238.6426	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.6173	86.2809	85.5815	83.9239	81.3183	79.8000	79.8000	79.8000	79.8000	84.3071	86.1260	86.6880	(217)
Fuel for water heating, kWh/month	278.4730	247.0812	264.6139	237.6062	237.8594	218.6117	216.0901	224.6831	227.1210	239.4490	248.8416	275.2892	(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	26.8635	21.5509	19.4042	14.2163	10.9811	8.9717	10.0173	13.0209	16.9129	22.1906	25.0642	27.6101	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.4808	-54.8091	-79.5789	-90.3942	-98.2255	-91.9154	-90.7373	-85.2643	-75.7693	-63.0405	-42.4857	-33.2003	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-20.0870	-42.4327	-84.6768	-127.6870	-169.3483	-170.3779	-168.4183	-142.4069	-104.0940	-60.9066	-26.8885	-15.8749	(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	4104.3399 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2915.7194 (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)	216.8036 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1977.1002 (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	5345.7627 (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	4104.3399	0.2100	861.9114	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2915.7194	0.2100	612.3011	(264)
Space and water heating			1474.2124	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	216.8036	0.1443	31.2915	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-843.9012	0.1344	-113.4052	
PV Unit electricity exported	-1133.1990	0.1258	-142.5251	
Total			-255.9303	(269)
Total CO2, kg/year			1261.5029	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.6200	(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	4104.3399	1.1300	4637.9041	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2915.7194	1.1300	3294.7629	(278)
Space and water heating			7932.6669	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	216.8036	1.5338	332.5407	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-843.9012	1.4966	-1263.0179	
PV Unit electricity exported	-1133.1990	0.4617	-523.1581	
Total			-1786.1760	(283)
Total Primary energy kWh/year			6609.1324	(286)
Target Primary Energy Rate (TPER)			66.0900	(287)

Full SAP Calculation Printout

Property Reference	House Type I	Issued on Date	05/10/2023
Assessment Reference	Plot 24	Prop Type Ref	
Property			

SAP Rating	82 B	DER	3.82	TER	8.86
Environmental	96 A	% DER < TER			56.88
CO_2 Emissions (t/year)	0.46	DFEE	31.69	TFEE	33.44
Compliance Check	See BREL	% DFEE < TFEE			5.25
% DPER < TPER	12.44	DPER	40.28	TPER	46.00

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
First floor	43.0000 (1c)	x	2.4000 (2c)	=	103.2000 (1c)	-
Second floor	37.0000 (1d)	x	2.4000 (2d)	=	88.8000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	130.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	312.0000	(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	1 * 10	=	10.0000 (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) =	10.0000 / (5)	=	0.0321 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			4.0000 (17)
Infiltration rate			0.2321 (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)	=	0.1972 (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	0.2515	0.2466	0.2416	0.2170	0.2120	0.1874	0.1874	0.1825	0.1972	0.2120	0.2219	0.2318	(22b)
Effective ac	0.5316	0.5304	0.5292	0.5235	0.5225	0.5176	0.5176	0.5166	0.5195	0.5225	0.5246	0.5269	(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	
Opening Type 1 (Uw = 1.20)			37.7000	1.1450	43.1679			(27)
Heatloss Floor 1			50.0000	0.1200	6.0000	110.0000	5500.0000	(28a)
External Wall 1	96.0000	37.7000	58.3000	0.1900	11.0770	190.0000	11077.0000	(29a)
External Roof 1	50.0000		50.0000	0.1500	7.5000	9.0000	450.0000	(30)
Total net area of external elements Aum(A, m2)			196.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	67.7449			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17027.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 130.9769 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	20.0000	0.0670	1.3400
E6 Intermediate floor within a dwelling	40.0000	0.0020	0.0800
E16 Corner (normal)	14.4000	0.0410	0.5904
E18 Party wall between dwellings	14.4000	0.0400	0.5760
E2 Other lintels (including other steel lintels)	18.1800	0.0240	0.4363
E3 Sill	14.9300	0.0190	0.2837
E4 Jamb	51.9000	0.0140	0.7266
E11 Eaves (insulation at rafter level)	22.0000	0.0110	0.2420

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.2750 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 72.0199 (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	54.7359	54.6094	54.4855	53.9034	53.7945	53.2876	53.2876	53.1937	53.4828	53.7945	54.0148	54.2452	(38)
Heat transfer coeff	126.7558	126.6294	126.5054	125.9234	125.8145	125.3075	125.3075	125.2136	125.5028	125.8145	126.0348	126.2651	(39)

Average = Sum(39)m / 12 = 125.9228

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9750	0.9741	0.9731	0.9686	0.9678	0.9639	0.9639	0.9632	0.9654	0.9678	0.9695	0.9713	(40)
HLP (average)												0.9686	
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 2.8950 (42)
Hot water usage for mixer showers

72.7593	71.6659	70.0725	67.0240	64.7742	62.2653	60.8392	62.4205	64.1538	66.8477	69.9617	72.4805	(42a)

Hot water usage for baths

31.4121	30.9456	30.2886	29.0773	28.1703	27.1646	26.6214	27.2737	27.9840	29.0602	30.2964	31.3059	(42b)

Hot water usage for other uses

44.2776	42.6675	41.0574	39.4473	37.8372	36.2271	36.2271	37.8372	39.4473	41.0574	42.6675	44.2776	(42c)

Average daily hot water use (litres/day) 136.4580 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.4490	145.2790	141.4186	135.5486	130.7817	125.6570	123.6877	127.5314	131.5852	136.9653	142.9256	148.0640	(44)
Energy conte	235.1069	206.8753	217.3551	185.5593	176.0573	154.5099	149.5895	157.9105	162.2577	185.8606	203.6238	231.8325	(45)

Energy content (annual) Total = Sum(45)m = 2266.5384
Distribution loss (46)m = 0.15 x (45)m

35.2660	31.0313	32.6033	27.8339	26.4086	23.1765	22.4384	23.6866	24.3387	27.8791	30.5436	34.7749	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

288.5013	255.1025	270.7495	237.2313	229.4517	206.1819	202.9839	211.3049	213.9297	239.2550	255.2958	285.2269	(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

288.5013	255.1025	270.7495	237.2313	229.4517	206.1819	202.9839	211.3049	213.9297	239.2550	255.2958	285.2269	(64)

Total per year (kWh/year) = Sum(64)m = 2895.2144 (64)
12Total per year (kWh/year) 2895 (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

120.8886	107.3678	114.9861	103.0361	101.2546	92.7122	92.4540	95.2208	95.2883	104.5142	109.0425	119.7998	(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	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	150.1658	166.2550	150.1658	155.1714	150.1658	155.1714	150.1658	150.1658	155.1714	150.1658	155.1714	150.1658	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	297.7205	300.8100	293.0247	276.4510	255.5295	235.8663	222.7301	219.6407	227.4259	243.9997	264.9211	284.5843	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	(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)													
	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	(71)

Water heating gains (Table 5)

	162.4846	159.7735	154.5512	143.1056	136.0949	128.7669	124.2662	127.9849	132.3448	140.4760	151.4479	161.0213 (72)

Total internal gains

	676.7959	693.2633	664.1666	641.1528	608.2151	586.2294	563.5870	564.2163	581.3670	601.0664	637.9653	662.1963 (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	4.9000	10.6334	0.7600	0.7000	0.7700	19.2094 (74)
East	13.7000	19.6403	0.7600	0.7000	0.7700	99.2002 (76)
West	19.1000	19.6403	0.7600	0.7000	0.7700	138.3011 (80)

Solar gains	256.7107	501.3130	827.5143	1216.1009	1502.5567	1544.4579	1467.7263	1251.9038	964.8838	594.9891	319.8334	211.3234 (83)
Total gains	933.5065	1194.5763	1491.6809	1857.2537	2110.7718	2130.6874	2031.3133	1816.1201	1546.2507	1196.0555	957.7987	873.5197 (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	37.3137	37.3509	37.3875	37.5603	37.5928	37.7449	37.7449	37.7732	37.6862	37.5928	37.5271	37.4587	
alpha	3.4876	3.4901	3.4925	3.5040	3.5062	3.5163	3.5163	3.5182	3.5124	3.5062	3.5018	3.4972	
util living area	0.9670	0.9295	0.8500	0.6956	0.5208	0.3687	0.2694	0.3133	0.5254	0.8116	0.9414	0.9731	(86)
Living	19.3082	19.7060	20.2104	20.6764	20.9010	20.9772	20.9943	20.9903	20.9250	20.5284	19.8133	19.2265	
Non living	18.1271	18.6242	19.2399	19.7825	20.0223	20.0975	20.1107	20.1090	20.0542	19.6341	18.7685	18.0263	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	11	
MIT	20.1345	19.7060	20.2104	20.6764	20.9010	20.9772	20.9943	20.9903	20.9250	20.5284	19.8133	19.4994	(87)
Th 2	20.1042	20.1050	20.1058	20.1095	20.1103	20.1135	20.1135	20.1141	20.1123	20.1103	20.1088	20.1073	(88)
util rest of house	0.9615	0.9187	0.8294	0.6617	0.4781	0.3201	0.2160	0.2545	0.4671	0.7782	0.9305	0.9685	(89)
MIT 2	19.3160	18.6242	19.2399	19.7825	20.0223	20.0975	20.1107	20.1090	20.0542	19.6341	18.7685	18.4388	(90)
Living area fraction										fLA = Living area / (4) =		0.1923	(91)
MIT	19.4734	18.8322	19.4266	19.9544	20.1913	20.2666	20.2806	20.2785	20.2217	19.8061	18.9694	18.6428	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4734	18.8322	19.4266	19.9544	20.1913	20.2666	20.2806	20.2785	20.2217	19.8061	18.9694	18.6428	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9570	0.8998	0.8117	0.6555	0.4821	0.3286	0.2261	0.2655	0.4745	0.7654	0.9128	0.9588	(94)
Useful gains	893.3244	1074.8780	1210.7784	1217.4114	1017.5057	700.0666	459.2614	482.1918	733.6805	915.4914	874.2742	837.5176	(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	1923.3179	1764.2305	1635.2812	1392.0088	1068.3319	710.0725	461.2044	485.6348	768.2899	1158.2554	1495.9615	1823.6166	(97)
Space heating kWh	766.3151	463.2448	315.8301	125.7101	37.8147	0.0000	0.0000	0.0000	0.0000	180.6164	447.6149	733.6577	(98a)
Space heating requirement - total per year (kWh/year)												3070.8038	
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	766.3151	463.2448	315.8301	125.7101	37.8147	0.0000	0.0000	0.0000	0.0000	180.6164	447.6149	733.6577	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3070.8038	
Space heating per m2											(98c) / (4) =	23.6216	(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 %) 284.4221 (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	766.3151	463.2448	315.8301	125.7101	37.8147	0.0000	0.0000	0.0000	0.0000	180.6164	447.6149	733.6577	(98)
Space heating efficiency (main heating system 1)	284.4221	284.4221	284.4221	284.4221	284.4221	0.0000	0.0000	0.0000	0.0000	284.4221	284.4221	284.4221	(210)
Space heating fuel (main heating system)	269.4288	162.8723	111.0427	44.1984	13.2953	0.0000	0.0000	0.0000	0.0000	63.5029	157.3770	257.9468	(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												
	288.5013	255.1025	270.7495	237.2313	229.4517	206.1819	202.9839	211.3049	213.9297	239.2550	255.2958	285.2269 (64)
Efficiency of water heater												145.5910 (216)
(217)m	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910 (217)
Fuel for water heating, kWh/month												
	198.1587	175.2185	185.9657	162.9436	157.6002	141.6172	139.4206	145.1359	146.9388	164.3336	175.3513	195.9096 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	40.7081	32.6575	29.4045	21.5430	16.6404	13.5954	15.1799	19.7315	25.6292	33.6269	37.9815	41.8395 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1079.6642 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	145.5910
Water heating fuel used	1988.5937 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	328.5373 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	3396.7952 (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	1079.6642	0.1570	169.4870	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1988.5937	0.1410	280.3039	(264)
Space and water heating			449.7909	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	328.5373	0.1443	47.4181	(268)
Total CO2, kg/year			497.2090	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8200	(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	1079.6642	1.5811	1707.0375	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1988.5937	1.5212	3025.0615	(278)
Space and water heating			4732.0990	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	328.5373	1.5338	503.9215	(282)
Total Primary energy kWh/year			5236.0205	(286)
Dwelling Primary energy Rate (DPER)			40.2800	(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	50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
First floor	43.0000 (1c)	x	2.4000 (2c)	=	103.2000 (1c)	-
Second floor	37.0000 (1d)	x	2.4000 (2d)	=	88.8000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	130.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	312.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1282	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3782	(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) =	0.3215	(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	0.4099	0.4018	0.3938	0.3536	0.3456	0.3054	0.3054	0.2974	0.3215	0.3456	0.3617	0.3777	(22b)
Effective ac	0.5840	0.5807	0.5775	0.5625	0.5597	0.5466	0.5466	0.5442	0.5517	0.5597	0.5654	0.5713	(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 Opening Type (Uw = 1.20)			32.5000	1.1450	37.2137			(27)
Heatloss Floor 1			50.0000	0.1300	6.5000			(28a)
External Wall 1	96.0000	32.5000	63.5000	0.1800	11.4300			(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000			(30)
Total net area of external elements Aum(A, m2)			196.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.6437			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	130.9769	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	20.0000	0.1600	3.2000
E6 Intermediate floor within a dwelling	40.0000	0.0000	0.0000
E16 Corner (normal)	14.4000	0.0900	1.2960
E18 Party wall between dwellings	14.4000	0.0600	0.8640
E2 Other lintels (including other steel lintels)	18.1800	0.0500	0.9090
E3 Sill	14.9300	0.0500	0.7465
E4 Jamb	51.9000	0.0500	2.5950
E11 Eaves (insulation at rafter level)	22.0000	0.0400	0.8800

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.4905	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	71.1342	(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	60.1287	59.7929	59.4637	57.9175	57.6282	56.2815	56.2815	56.0321	56.8002	57.6282	58.2134	58.8253	(38)
Heat transfer coeff	131.2630	130.9271	130.5979	129.0517	128.7624	127.4158	127.4158	127.1664	127.9345	128.7624	129.3477	129.9595	(39)
Average = Sum(39)m / 12 =												129.0503	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0097	1.0071	1.0046	0.9927	0.9905	0.9801	0.9801	0.9782	0.9841	0.9905	0.9950	0.9997	(40)
HLP (average)												0.9927	
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 2.8950 (42)

Hot water usage for mixer showers

72.7593	71.6659	70.0725	67.0240	64.7742	62.2653	60.8392	62.4205	64.1538	66.8477	69.9617	72.4805 (42a)

Hot water usage for baths

31.4121	30.9456	30.2886	29.0773	28.1703	27.1646	26.6214	27.2737	27.9840	29.0602	30.2964	31.3059 (42b)

Hot water usage for other uses

44.2776	42.6675	41.0574	39.4473	37.8372	36.2271	36.2271	37.8372	39.4473	41.0574	42.6675	44.2776 (42c)

Average daily hot water use (litres/day) 136.4580 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.4490	145.2790	141.4186	135.5486	130.7817	125.6570	123.6877	127.5314	131.5852	136.9653	142.9256	148.0640	(44)
Energy conte	235.1069	206.8753	217.3551	185.5593	176.0573	154.5099	149.5895	157.9105	162.2577	185.8606	203.6238	231.8325	(45)
Energy content (annual)										Total = Sum(45)m =		2266.5384	
Distribution loss (46)m = 0.15 x (45)m													
	35.2660	31.0313	32.6033	27.8339	26.4086	23.1765	22.4384	23.6866	24.3387	27.8791	30.5436	34.7749	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	281.7018	248.9610	263.9500	230.6511	222.6523	199.6018	196.1844	204.5054	207.3495	232.4555	248.7156	278.4274	(62)
WWHRS	-33.2625	-29.4176	-30.8045	-25.5073	-23.7719	-20.3418	-19.0672	-20.2760	-21.0464	-24.8114	-28.1083	-32.6465	(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													
	248.4393	219.5434	233.1455	205.1438	198.8804	179.2600	177.1173	184.2294	186.3031	207.6441	220.6074	245.7808	(64)
										Total per year (kWh/year) = Sum(64)m =		2506.0944	(64)
12Total per year (kWh/year)												2506	(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													
	115.4490	102.4546	109.5465	97.7719	95.8150	87.4480	87.0144	89.7812	90.0242	99.0746	103.7784	114.3602	(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	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	150.1658	166.2550	150.1658	155.1714	150.1658	155.1714	150.1658	150.1658	155.1714	150.1658	155.1714	150.1658	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	297.7205	300.8100	293.0247	276.4510	255.5295	235.8663	222.7301	219.6407	227.4259	243.9997	264.9211	284.5843	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	(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)													
	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	(71)
Water heating gains (Table 5)													
	155.1733	152.4622	147.2399	135.7943	128.7836	121.4556	116.9549	120.6736	125.0335	133.1647	144.1366	153.7100	(72)
Total internal gains													
	672.4846	688.9520	659.8553	636.8415	603.9038	578.9181	556.2757	556.9050	574.0557	596.7551	633.6540	657.8850	(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	4.2200	10.6334	0.6300	0.7000	0.7700	13.7137	(74)
East	11.8100	19.6403	0.6300	0.7000	0.7700	70.8874	(76)
West	16.4700	19.6403	0.6300	0.7000	0.7700	98.8582	(80)

Solar gains	183.4594	358.2661	591.3862	869.0842	1073.7903	1103.7300	1048.8966	894.6675	689.5560	425.2121	228.5705	151.0230	(83)
Total gains	855.9439	1047.2181	1251.2415	1505.9257	1677.6941	1682.6482	1605.1723	1451.5725	1263.6116	1021.9672	862.2245	808.9080	(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	36.0324	36.1248	36.2159	36.6498	36.7322	37.1204	37.1204	37.1932	36.9699	36.7322	36.5660	36.3938	
alpha	3.4022	3.4083	3.4144	3.4433	3.4488	3.4747	3.4747	3.4795	3.4647	3.4488	3.4377	3.4263	
util living area													
	0.9747	0.9514	0.9018	0.7888	0.6316	0.4637	0.3433	0.3926	0.6225	0.8667	0.9567	0.9788	(86)
MIT	19.1280	19.4662	19.9432	20.4821	20.8087	20.9509	20.9868	20.9791	20.8664	20.3712	19.6524	19.0755	(87)
Th 2	20.0752	20.0774	20.0795	20.0894	20.0913	20.0999	20.0999	20.1015	20.0966	20.0913	20.0875	20.0836	(88)
util rest of house													
	0.9703	0.9433	0.8861	0.7584	0.5855	0.4047	0.2755	0.3199	0.5597	0.8389	0.9482	0.9751	(89)
MIT 2	17.8812	18.3082	18.9016	19.5525	19.9165	20.0644	20.0932	20.0902	19.9897	19.4422	18.5550	17.8201	(90)
Living area fraction										fLA = Living area / (4) =		0.1923	(91)
MIT	18.1210	18.5309	19.1019	19.7313	20.0881	20.2349	20.2650	20.2611	20.1583	19.6208	18.7660	18.0615	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1210	18.5309	19.1019	19.7313	20.0881	20.2349	20.2650	20.2611	20.1583	19.6208	18.7660	18.0615	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9574	0.9258	0.8660	0.7452	0.5853	0.4137	0.2881	0.3331	0.5642	0.8220	0.9317	0.9635	(94)
Useful gains	819.5072	969.4764	1083.5751	1122.2823	982.0024	696.1493	462.4279	483.4676	712.9570	840.0972	803.3489	779.3699	(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													
	1814.1833	1784.6484	1645.7812	1397.7948	1080.0731	717.9756	466.9833	491.0040	775.0638	1161.5438	1508.9703	1801.4381	(97)
Space heating kWh													
	740.0390	547.7955	418.2814	198.3690	72.9645	0.0000	0.0000	0.0000	0.0000	239.1563	508.0474	760.4187	(98a)
Space heating requirement - total per year (kWh/year)												3485.0719	
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													
	740.0390	547.7955	418.2814	198.3690	72.9645	0.0000	0.0000	0.0000	0.0000	239.1563	508.0474	760.4187	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3485.0719	
Space heating per m2											(98c) / (4) =	26.8082	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	740.0390	547.7955	418.2814	198.3690	72.9645	0.0000	0.0000	0.0000	0.0000	239.1563	508.0474	760.4187	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	801.7757	593.4946	453.1759	214.9176	79.0515	0.0000	0.0000	0.0000	0.0000	259.1076	550.4306	823.8556	(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													
	248.4393	219.5434	233.1455	205.1438	198.8804	179.2600	177.1173	184.2294	186.3031	207.6441	220.6074	245.7808	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3523	86.0242	85.3547	83.9845	82.0315	79.8000	79.8000	79.8000	79.8000	84.3775	85.8680	86.4192	(217)
Fuel for water heating, kWh/month													
	287.7045	255.2113	273.1490	244.2638	242.4438	224.6366	221.9514	230.8639	233.4626	246.0895	256.9146	284.4052	(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	31.2015	25.0310	22.5376	16.5120	12.7544	10.4204	11.6350	15.1236	19.6440	25.7740	29.1117	32.0687	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-47.2328	-66.8287	-96.3826	-108.7056	-117.4380	-109.6108	-108.1654	-101.9512	-91.1065	-76.4703	-51.9757	-40.7999	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-25.9771	-54.7235	-108.9369	-163.8959	-217.0292	-218.2558	-215.7790	-182.6378	-133.7227	-78.4635	-34.7421	-20.5441	(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												3775.8092	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater		79.8000
Water heating fuel used		3001.0963 (219)
Space cooling fuel		0.0000 (221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year		86.0000 (231)
Electricity for lighting (calculated in Appendix L)		251.8139 (232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation		-2471.3753 (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		4643.3441 (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	3775.8092	0.2100	792.9199	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3001.0963	0.2100	630.2302	(264)
Space and water heating			1423.1502	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	251.8139	0.1443	36.3445	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1016.6676	0.1345	-136.7767	
PV Unit electricity exported	-1454.7077	0.1258	-183.0540	
Total			-319.8306	(269)
Total CO2, kg/year			1151.5933	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.8600	(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	3775.8092	1.1300	4266.6644	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3001.0963	1.1300	3391.2388	(278)
Space and water heating			7657.9032	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	251.8139	1.5338	386.2406	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1016.6676	1.4972	-1522.1682	
PV Unit electricity exported	-1454.7077	0.4619	-671.9285	
Total			-2194.0967	(283)
Total Primary energy kWh/year			5980.1479	(286)
Target Primary Energy Rate (TPER)			46.0000	(287)

Full SAP Calculation Printout

Property Reference	House Type I	Issued on Date	05/10/2023
Assessment Reference	Plot 25	Prop Type Ref	
Property			

SAP Rating	82 B	DER	3.74	TER	8.58
Environmental	96 A	% DER < TER			56.41
CO_2 Emissions (t/year)	0.45	DFEE	30.29	TFEE	32.23
Compliance Check	See BREL	% DFEE < TFEE			6.04
% DPER < TPER	11.41	DPER	39.42	TPER	44.50

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
First floor	43.0000 (1c)	x	2.4000 (2c)	=	103.2000 (1c)	-
Second floor	37.0000 (1d)	x	2.4000 (2d)	=	88.8000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	130.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	312.0000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0321	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2321	(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) =	0.1972	(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	0.2515	0.2466	0.2416	0.2170	0.2120	0.1874	0.1874	0.1825	0.1972	0.2120	0.2219	0.2318	(22b)
Effective ac	0.5316	0.5304	0.5292	0.5235	0.5225	0.5176	0.5176	0.5166	0.5195	0.5225	0.5246	0.5269	(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	
Opening Type 1 (Uw = 1.20)			37.7000	1.1450	43.1679			(27)
Heatloss Floor 1			50.0000	0.1200	6.0000	110.0000	5500.0000	(28a)
External Wall 1	96.0000	37.7000	58.3000	0.1900	11.0770	190.0000	11077.0000	(29a)
External Roof 1	50.0000		50.0000	0.1500	7.5000	9.0000	450.0000	(30)
Total net area of external elements Aum(A, m2)			196.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		67.7449			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17027.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 130.9769 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	20.0000	0.0670	1.3400
E6 Intermediate floor within a dwelling	40.0000	0.0020	0.0800
E16 Corner (normal)	14.4000	0.0410	0.5904
E18 Party wall between dwellings	14.4000	0.0400	0.5760
E2 Other lintels (including other steel lintels)	18.1800	0.0240	0.4363
E3 Sill	14.9300	0.0190	0.2837
E4 Jamb	51.9000	0.0140	0.7266
E11 Eaves (insulation at rafter level)	22.0000	0.0110	0.2420

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.2750 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 72.0199 (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	54.7359	54.6094	54.4855	53.9034	53.7945	53.2876	53.2876	53.1937	53.4828	53.7945	54.0148	54.2452	(38)
Heat transfer coeff	126.7558	126.6294	126.5054	125.9234	125.8145	125.3075	125.3075	125.2136	125.5028	125.8145	126.0348	126.2651	(39)

Average = Sum(39)m / 12 = 125.9228

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9750	0.9741	0.9731	0.9686	0.9678	0.9639	0.9639	0.9632	0.9654	0.9678	0.9695	0.9713	(40)
HLP (average)												0.9686	
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 2.8950 (42)
Hot water usage for mixer showers

72.7593	71.6659	70.0725	67.0240	64.7742	62.2653	60.8392	62.4205	64.1538	66.8477	69.9617	72.4805	(42a)

Hot water usage for baths

31.4121	30.9456	30.2886	29.0773	28.1703	27.1646	26.6214	27.2737	27.9840	29.0602	30.2964	31.3059	(42b)

Hot water usage for other uses

44.2776	42.6675	41.0574	39.4473	37.8372	36.2271	36.2271	37.8372	39.4473	41.0574	42.6675	44.2776	(42c)

Average daily hot water use (litres/day) 136.4580 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.4490	145.2790	141.4186	135.5486	130.7817	125.6570	123.6877	127.5314	131.5852	136.9653	142.9256	148.0640	(44)
Energy conte	235.1069	206.8753	217.3551	185.5593	176.0573	154.5099	149.5895	157.9105	162.2577	185.8606	203.6238	231.8325	(45)

Energy content (annual) Total = Sum(45)m = 2266.5384
Distribution loss (46)m = 0.15 x (45)m

35.2660	31.0313	32.6033	27.8339	26.4086	23.1765	22.4384	23.6866	24.3387	27.8791	30.5436	34.7749	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

288.5013	255.1025	270.7495	237.2313	229.4517	206.1819	202.9839	211.3049	213.9297	239.2550	255.2958	285.2269	(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

288.5013	255.1025	270.7495	237.2313	229.4517	206.1819	202.9839	211.3049	213.9297	239.2550	255.2958	285.2269	(64)

Total per year (kWh/year) = Sum(64)m = 2895.2144 (64)
12Total per year (kWh/year) 2895 (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

120.8886	107.3678	114.9861	103.0361	101.2546	92.7122	92.4540	95.2208	95.2883	104.5142	109.0425	119.7998	(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	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	150.1658	166.2550	150.1658	155.1714	150.1658	155.1714	150.1658	150.1658	155.1714	150.1658	155.1714	150.1658	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	297.7205	300.8100	293.0247	276.4510	255.5295	235.8663	222.7301	219.6407	227.4259	243.9997	264.9211	284.5843	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	(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)													
	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	(71)

Water heating gains (Table 5)

	162.4846	159.7735	154.5512	143.1056	136.0949	128.7669	124.2662	127.9849	132.3448	140.4760	151.4479	161.0213 (72)

Total internal gains

	676.7959	693.2633	664.1666	641.1528	608.2151	586.2294	563.5870	564.2163	581.3670	601.0664	637.9653	662.1963 (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
East	13.7000	19.6403	0.7600	0.7000	0.7700	99.2002 (76)
South	4.9000	46.7521	0.7600	0.7000	0.7700	84.4582 (78)
West	19.1000	19.6403	0.7600	0.7000	0.7700	138.3011 (80)

Solar gains	321.9595	602.9237	941.3310	1315.0435	1575.0978	1599.6693	1527.9470	1334.3678	1073.9412	700.4825	396.2480	268.2892 (83)
Total gains	998.7554	1296.1870	1605.4976	1956.1963	2183.3129	2185.8987	2091.5340	1898.5841	1655.3081	1301.5489	1034.2132	930.4854 (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	37.3137	37.3509	37.3875	37.5603	37.5928	37.7449	37.7449	37.7732	37.6862	37.5928	37.5271	37.4587	
alpha	3.4876	3.4901	3.4925	3.5040	3.5062	3.5163	3.5163	3.5182	3.5124	3.5062	3.5018	3.4972	
util living area	0.9602	0.9137	0.8261	0.6727	0.5062	0.3600	0.2618	0.3002	0.4961	0.7801	0.9287	0.9678	(86)
Living	19.3866	19.8091	20.2917	20.7099	20.9094	20.9789	20.9948	20.9915	20.9373	20.5907	19.8953	19.2969	
Non living	18.2254	18.7504	19.3347	19.8181	20.0301	20.0987	20.1109	20.1097	20.0642	19.7020	18.8688	18.1149	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	11	
MIT	20.1746	19.8091	20.2917	20.7099	20.9094	20.9789	20.9948	20.9915	20.9373	20.5907	19.8953	19.5590	(87)
Th 2	20.1042	20.1050	20.1058	20.1095	20.1103	20.1135	20.1135	20.1141	20.1123	20.1103	20.1088	20.1073	(88)
util rest of house	0.9537	0.9011	0.8036	0.6384	0.4642	0.3123	0.2098	0.2436	0.4397	0.7443	0.9159	0.9624	(89)
MIT 2	19.3552	18.7504	19.3347	19.8181	20.0301	20.0987	20.1109	20.1097	20.0642	19.7020	18.8688	18.5098	(90)
Living area fraction									fLA = Living area / (4) =			0.1923	(91)
MIT	19.5128	18.9540	19.5188	19.9896	20.1992	20.2679	20.2809	20.2792	20.2321	19.8729	19.0662	18.7116	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5128	18.9540	19.5188	19.9896	20.1992	20.2679	20.2809	20.2792	20.2321	19.8729	19.0662	18.7116	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9487	0.8816	0.7872	0.6336	0.4685	0.3207	0.2197	0.2543	0.4475	0.7337	0.8974	0.9517	(94)
Useful gains	947.5413	1142.7464	1263.8596	1239.3809	1022.7951	700.9736	459.4743	482.7410	740.7392	954.9909	928.0576	885.5325	(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	1928.3053	1779.6512	1646.9448	1396.4398	1069.3214	710.2356	461.2428	485.7339	769.6013	1166.6641	1508.1553	1832.3073	(97)
Space heating kWh	729.6884	428.0000	285.0154	113.0824	34.6156	0.0000	0.0000	0.0000	0.0000	157.4849	417.6703	704.4005	(98a)
Space heating requirement - total per year (kWh/year)												2869.9575	
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	729.6884	428.0000	285.0154	113.0824	34.6156	0.0000	0.0000	0.0000	0.0000	157.4849	417.6703	704.4005	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2869.9575	
Space heating per m2											(98c) / (4) =	22.0766	(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 %) 284.4221 (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	729.6884	428.0000	285.0154	113.0824	34.6156	0.0000	0.0000	0.0000	0.0000	157.4849	417.6703	704.4005	(98)
Space heating efficiency (main heating system 1)	284.4221	284.4221	284.4221	284.4221	284.4221	0.0000	0.0000	0.0000	0.0000	284.4221	284.4221	284.4221	(210)
Space heating fuel (main heating system)	256.5512	150.4806	100.2086	39.7587	12.1705	0.0000	0.0000	0.0000	0.0000	55.3701	146.8487	247.6602	(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												
	288.5013	255.1025	270.7495	237.2313	229.4517	206.1819	202.9839	211.3049	213.9297	239.2550	255.2958	285.2269 (64)
Efficiency of water heater												145.5910 (216)
(217)m	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910 (217)
Fuel for water heating, kWh/month												
	198.1587	175.2185	185.9657	162.9436	157.6002	141.6172	139.4206	145.1359	146.9388	164.3336	175.3513	195.9096 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	40.7081	32.6575	29.4045	21.5430	16.6404	13.5954	15.1799	19.7315	25.6292	33.6269	37.9815	41.8395 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1009.0486 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	145.5910
Water heating fuel used	1988.5937 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	328.5373 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	3326.1796 (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	1009.0486	0.1572	158.5918	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1988.5937	0.1410	280.3039	(264)
Space and water heating			438.8957	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	328.5373	0.1443	47.4181	(268)
Total CO2, kg/year			486.3138	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7400	(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	1009.0486	1.5818	1596.0799	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1988.5937	1.5212	3025.0615	(278)
Space and water heating			4621.1414	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	328.5373	1.5338	503.9215	(282)
Total Primary energy kWh/year			5125.0629	(286)
Dwelling Primary energy Rate (DPER)			39.4200	(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	50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
First floor	43.0000 (1c)	x	2.4000 (2c)	=	103.2000 (1c)	-
Second floor	37.0000 (1d)	x	2.4000 (2d)	=	88.8000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	130.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	312.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1282	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3782	(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) =	0.3215	(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	0.4099	0.4018	0.3938	0.3536	0.3456	0.3054	0.3054	0.2974	0.3215	0.3456	0.3617	0.3777	(22b)
Effective ac	0.5840	0.5807	0.5775	0.5625	0.5597	0.5466	0.5466	0.5442	0.5517	0.5597	0.5654	0.5713	(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 Opening Type (Uw = 1.20)			32.5000	1.1450	37.2137			(27)
Heatloss Floor 1			50.0000	0.1300	6.5000			(28a)
External Wall 1	96.0000	32.5000	63.5000	0.1800	11.4300			(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000			(30)
Total net area of external elements Aum(A, m2)			196.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.6437			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	130.9769	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	20.0000	0.1600	3.2000
E6 Intermediate floor within a dwelling	40.0000	0.0000	0.0000
E16 Corner (normal)	14.4000	0.0900	1.2960
E18 Party wall between dwellings	14.4000	0.0600	0.8640
E2 Other lintels (including other steel lintels)	18.1800	0.0500	0.9090
E3 Sill	14.9300	0.0500	0.7465
E4 Jamb	51.9000	0.0500	2.5950
E11 Eaves (insulation at rafter level)	22.0000	0.0400	0.8800

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.4905	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	71.1342	(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	60.1287	59.7929	59.4637	57.9175	57.6282	56.2815	56.2815	56.0321	56.8002	57.6282	58.2134	58.8253	(38)
Heat transfer coeff	131.2630	130.9271	130.5979	129.0517	128.7624	127.4158	127.4158	127.1664	127.9345	128.7624	129.3477	129.9595	(39)
Average = Sum(39)m / 12 =												129.0503	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0097	1.0071	1.0046	0.9927	0.9905	0.9801	0.9801	0.9782	0.9841	0.9905	0.9950	0.9997	(40)
HLP (average)												0.9927	
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												2.8950	(42)
Hot water usage for mixer showers													
	72.7593	71.6659	70.0725	67.0240	64.7742	62.2653	60.8392	62.4205	64.1538	66.8477	69.9617	72.4805	(42a)
Hot water usage for baths													
	31.4121	30.9456	30.2886	29.0773	28.1703	27.1646	26.6214	27.2737	27.9840	29.0602	30.2964	31.3059	(42b)
Hot water usage for other uses													
	44.2776	42.6675	41.0574	39.4473	37.8372	36.2271	36.2271	37.8372	39.4473	41.0574	42.6675	44.2776	(42c)
Average daily hot water use (litres/day)												136.4580	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.4490	145.2790	141.4186	135.5486	130.7817	125.6570	123.6877	127.5314	131.5852	136.9653	142.9256	148.0640	(44)
Energy conte	235.1069	206.8753	217.3551	185.5593	176.0573	154.5099	149.5895	157.9105	162.2577	185.8606	203.6238	231.8325	(45)
Energy content (annual)											Total = Sum(45)m =	2266.5384	
Distribution loss (46)m = 0.15 x (45)m													
	35.2660	31.0313	32.6033	27.8339	26.4086	23.1765	22.4384	23.6866	24.3387	27.8791	30.5436	34.7749	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	281.7018	248.9610	263.9500	230.6511	222.6523	199.6018	196.1844	204.5054	207.3495	232.4555	248.7156	278.4274	(62)
WWHRS	-33.2625	-29.4176	-30.8045	-25.5073	-23.7719	-20.3418	-19.0672	-20.2760	-21.0464	-24.8114	-28.1083	-32.6465	(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													
	248.4393	219.5434	233.1455	205.1438	198.8804	179.2600	177.1173	184.2294	186.3031	207.6441	220.6074	245.7808	(64)
										Total per year (kWh/year) = Sum(64)m =		2506.0944	(64)
12Total per year (kWh/year)												2506	(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													
	115.4490	102.4546	109.5465	97.7719	95.8150	87.4480	87.0144	89.7812	90.0242	99.0746	103.7784	114.3602	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	150.1658	166.2550	150.1658	155.1714	150.1658	155.1714	150.1658	150.1658	155.1714	150.1658	155.1714	150.1658	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	297.7205	300.8100	293.0247	276.4510	255.5295	235.8663	222.7301	219.6407	227.4259	243.9997	264.9211	284.5843	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	(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)													
	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	(71)
Water heating gains (Table 5)													
	155.1733	152.4622	147.2399	135.7943	128.7836	121.4556	116.9549	120.6736	125.0335	133.1647	144.1366	153.7100	(72)
Total internal gains													
	672.4846	688.9520	659.8553	636.8415	603.9038	578.9181	556.2757	556.9050	574.0557	596.7551	633.6540	657.8850	(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	
East	11.8100	19.6403	0.6300	0.7000	0.7700	70.8874	(76)
South	4.2200	46.7521	0.6300	0.7000	0.7700	60.2955	(78)
West	16.4700	19.6403	0.6300	0.7000	0.7700	98.8582	(80)

Solar gains	230.0411	430.8069	672.6410	939.7202	1125.5781	1143.1459	1091.8887	953.5394	767.4131	500.5248	283.1236	191.6914	(83)
Total gains	902.5257	1119.7590	1332.4963	1576.5618	1729.4819	1722.0641	1648.1644	1510.4444	1341.4688	1097.2800	916.7776	849.5764	(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	36.0324	36.1248	36.2159	36.6498	36.7322	37.1204	37.1204	37.1932	36.9699	36.7322	36.5660	36.3938	
alpha	3.4022	3.4083	3.4144	3.4433	3.4488	3.4747	3.4747	3.4795	3.4647	3.4488	3.4377	3.4263	
util living area													
	0.9707	0.9422	0.8867	0.7712	0.6179	0.4543	0.3348	0.3784	0.5956	0.8454	0.9491	0.9756	(86)
MIT	19.1855	19.5472	20.0167	20.5209	20.8214	20.9539	20.9878	20.9813	20.8836	20.4293	19.7150	19.1268	(87)
Th 2	20.0752	20.0774	20.0795	20.0894	20.0913	20.0999	20.0999	20.1015	20.0966	20.0913	20.0875	20.0836	(88)
util rest of house													
	0.9657	0.9328	0.8693	0.7398	0.5719	0.3961	0.2685	0.3079	0.5334	0.8150	0.9392	0.9713	(89)
MIT 2	17.9537	18.4085	18.9896	19.5955	19.9288	20.0667	20.0937	20.0915	20.0045	19.5079	18.6323	17.8849	(90)
Living area fraction										fLA = Living area / (4) =		0.1923	(91)
MIT	18.1906	18.6275	19.1871	19.7735	20.1004	20.2373	20.2657	20.2626	20.1736	19.6851	18.8405	18.1237	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1906	18.6275	19.1871	19.7735	20.1004	20.2373	20.2657	20.2626	20.1736	19.6851	18.8405	18.1237	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9517	0.9142	0.8494	0.7279	0.5724	0.4052	0.2808	0.3208	0.5390	0.7994	0.9218	0.9588	(94)
Useful gains	858.8907	1023.6783	1131.8274	1147.5282	990.0082	697.8130	462.8614	484.4973	723.0027	877.1191	845.0464	814.5494	(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													
	1823.3211	1797.2997	1656.9119	1403.2450	1081.6607	718.2835	467.0626	491.1925	777.0194	1169.8195	1518.6077	1809.5172	(97)
Space heating kWh													
	717.5362	519.8735	390.6628	184.1161	68.1894	0.0000	0.0000	0.0000	0.0000	217.7691	484.9642	740.2561	(98a)
Space heating requirement - total per year (kWh/year)												3323.3674	
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													
	717.5362	519.8735	390.6628	184.1161	68.1894	0.0000	0.0000	0.0000	0.0000	217.7691	484.9642	740.2561	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3323.3674	
Space heating per m2										(98c) / (4) =		25.5644	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	717.5362	519.8735	390.6628	184.1161	68.1894	0.0000	0.0000	0.0000	0.0000	217.7691	484.9642	740.2561	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	777.3957	563.2433	423.2534	199.4757	73.8780	0.0000	0.0000	0.0000	0.0000	235.9362	525.4216	802.0109	(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													
	248.4393	219.5434	233.1455	205.1438	198.8804	179.2600	177.1173	184.2294	186.3031	207.6441	220.6074	245.7808	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.2968	85.9227	85.2083	83.8181	81.9199	79.8000	79.8000	79.8000	79.8000	84.1667	85.7753	86.3719	(217)
Fuel for water heating, kWh/month													
	287.8892	255.5125	273.6182	244.7488	242.7742	224.6366	221.9514	230.8639	233.4626	246.7057	257.1921	284.5611	(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	31.2015	25.0310	22.5376	16.5120	12.7544	10.4204	11.6350	15.1236	19.6440	25.7740	29.1117	32.0687	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-47.2328	-66.8287	-96.3826	-108.7056	-117.4380	-109.6108	-108.1654	-101.9512	-91.1065	-76.4703	-51.9757	-40.7999	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-25.9771	-54.7235	-108.9369	-163.8959	-217.0292	-218.2558	-215.7790	-182.6378	-133.7227	-78.4635	-34.7421	-20.5441	(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												3600.6148	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	79.8000
Water heating fuel used	3003.9165 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	251.8139 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2471.3753 (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	4470.9700 (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	3600.6148	0.2100	756.1291	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3003.9165	0.2100	630.8225	(264)
Space and water heating			1386.9516	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	251.8139	0.1443	36.3445	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1016.6676	0.1345	-136.7767	
PV Unit electricity exported	-1454.7077	0.1258	-183.0540	
Total			-319.8306	(269)
Total CO2, kg/year			1115.3948	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.5800	(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	3600.6148	1.1300	4068.6947	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3003.9165	1.1300	3394.4257	(278)
Space and water heating			7463.1204	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	251.8139	1.5338	386.2406	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1016.6676	1.4972	-1522.1682	
PV Unit electricity exported	-1454.7077	0.4619	-671.9285	
Total			-2194.0967	(283)
Total Primary energy kWh/year			5785.3651	(286)
Target Primary Energy Rate (TPER)			44.5000	(287)

Full SAP Calculation Printout

Property Reference	House Type G	Issued on Date	05/10/2023
Assessment Reference	Plot 26	Prop Type Ref	
Property			

SAP Rating	89 B	DER	1.86	TER	5.02
Environmental	98 A	% DER < TER			62.95
CO_2 Emissions (t/year)	0.78	DFEE	18.83	TFEE	19.78
Compliance Check	See BREL	% DFEE < TFEE			4.80
% DPER < TPER	27.60	DPER	19.35	TPER	26.72

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	41.0000 (1b)	x	2.4000 (2b)	=	98.4000 (1b)	-
First floor	410.0000 (1c)	x	2.4000 (2c)	=	984.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	451.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1082.4000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0092	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2092	(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) =	0.1779	(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	0.2268	0.2223	0.2179	0.1956	0.1912	0.1690	0.1690	0.1645	0.1779	0.1912	0.2001	0.2090	(22b)
Effective ac	0.5257	0.5247	0.5237	0.5191	0.5183	0.5143	0.5143	0.5135	0.5158	0.5183	0.5200	0.5218	(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	
Opening Type 1 (Uw = 1.20)			20.6000	1.1450	23.5878			(27)
Heatloss Floor 1			41.0000	0.1200	4.9200	110.0000	4510.0000	(28a)
External Wall 1	86.0000	20.6000	65.4000	0.1900	12.4260	190.0000	12426.0000	(29a)
External Roof 1	41.0000		41.0000	0.1500	6.1500	9.0000	369.0000	(30)
Total net area of external elements Aum(A, m2)			168.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.0838			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17305.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 38.3703 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	18.0000	0.0670	1.2060
E6 Intermediate floor within a dwelling	18.0000	0.0020	0.0360
E16 Corner (normal)	9.6000	0.0410	0.3936
E18 Party wall between dwellings	9.6000	0.0400	0.3840
E2 Other lintels (including other steel lintels)	5.2000	0.0240	0.1248
E3 Sill	3.4500	0.0190	0.0655
E4 Jamb	8.9000	0.0140	0.1246
E11 Eaves (insulation at rafter level)	8.2000	0.0110	0.0902
E12 Gable (insulation at ceiling level)	10.0000	0.0330	0.3300

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.7548 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 49.8385 (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	187.7796	187.4230	187.0735	185.4316	185.1245	183.6945	183.6945	183.4297	184.2453	185.1245	185.7459	186.3955	(38)
Heat transfer coeff	237.6182	237.2615	236.9120	235.2702	234.9630	233.5330	233.5330	233.2682	234.0838	234.9630	235.5844	236.2341	(39)

Average = Sum(39)m / 12 = 235.2687

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5269	0.5261	0.5253	0.5217	0.5210	0.5178	0.5178	0.5172	0.5190	0.5210	0.5224	0.5238	(40)
HLP (average)												0.5217	
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 3.3282 (42)
Hot water usage for mixer showers

80.0234	78.8208	77.0684	73.7155	71.2411	68.4817	66.9132	68.6524	70.5588	73.5216	76.9466	79.7168	(42a)

Hot water usage for baths

34.5359	34.0230	33.3007	31.9690	30.9718	29.8660	29.2688	29.9860	30.7669	31.9501	33.3093	34.4192	(42b)

Hot water usage for other uses

48.7144	46.9430	45.1715	43.4001	41.6287	39.8572	39.8572	41.6287	43.4001	45.1715	46.9430	48.7144	(42c)

Average daily hot water use (litres/day) 150.0850 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	163.2737	159.7868	155.5407	149.0846	143.8415	138.2050	136.0392	140.2671	144.7259	150.6432	157.1988	162.8504	(44)
Energy conte	258.5857	227.5343	239.0602	204.0893	193.6384	169.9391	164.5277	173.6799	178.4615	204.4215	223.9585	254.9844	(45)

Energy content (annual) Total = Sum(45)m = 2492.8804
Distribution loss (46)m = 0.15 x (45)m

38.7879	34.1301	35.8590	30.6134	29.0458	25.4909	24.6792	26.0520	26.7692	30.6632	33.5938	38.2477	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

311.9801	275.7615	292.4546	255.7613	247.0328	221.6111	217.9221	227.0743	230.1335	257.8159	275.6305	308.3788	(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

311.9801	275.7615	292.4546	255.7613	247.0328	221.6111	217.9221	227.0743	230.1335	257.8159	275.6305	308.3788	(64)

Total per year (kWh/year) = Sum(64)m = 3121.5564 (64)
12Total per year (kWh/year) 3122 (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

128.6953	114.2369	122.2030	109.1973	107.1003	97.8424	97.4210	100.4641	100.6760	110.6857	115.8038	127.4978	(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	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	378.9843	419.5897	378.9843	391.6171	378.9843	391.6171	378.9843	378.9843	391.6171	378.9843	391.6171	378.9843	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	571.5124	577.4429	562.4982	530.6827	490.5214	452.7754	427.5588	421.6282	436.5729	468.3884	508.5498	546.2958	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	(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)	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	(71)

Water heating gains (Table 5)

	172.9775	169.9954	164.2514	151.6629	143.9520	135.8922	130.9422	135.0324	139.8278	148.7710	160.8386	171.3680 (72)

Total internal gains

	1196.3976	1239.9515	1178.6573	1146.8862	1086.3811	1053.2081	1010.4086	1008.5684	1040.9413	1069.0672	1133.9289	1169.5715 (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
East	5.8000	19.6403	0.7600	0.7000	0.7700	41.9972 (76)
South	5.3000	46.7521	0.7600	0.7000	0.7700	91.3527 (78)
West	9.5000	19.6403	0.7600	0.7000	0.7700	68.7885 (80)

Solar gains	202.1384	366.3325	547.4869	735.9244	862.3830	869.0401	832.7662	739.0042	614.1809	418.5277	246.4209	170.0419 (83)
Total gains	1398.5360	1606.2840	1726.1442	1882.8105	1948.7641	1922.2482	1843.1748	1747.5725	1655.1222	1487.5949	1380.3498	1339.6134 (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	20.2297	20.2601	20.2900	20.4316	20.4583	20.5836	20.5836	20.6069	20.5351	20.4583	20.4043	20.3482	
alpha	2.3486	2.3507	2.3527	2.3621	2.3639	2.3722	2.3722	2.3738	2.3690	2.3639	2.3603	2.3565	
util living area	0.9423	0.9200	0.8906	0.8302	0.7418	0.6110	0.4858	0.5218	0.6945	0.8509	0.9203	0.9474	(86)
Living	18.1010	18.4364	18.9212	19.5897	20.1870	20.6473	20.8544	20.8222	20.4873	19.7052	18.7994	18.0395	
Non living	16.9375	17.3643	17.9810	18.8273	19.5728	20.1325	20.3692	20.3360	19.9468	18.9803	17.8317	16.8607	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	15	0	0	0	0	0	0	0	0	0	31	
16 / 9	0	13	31	8	0	0	0	0	0	0	30	0	
MIT	21.0000	20.3259	19.8226	19.7528	20.1870	20.6473	20.8544	20.8222	20.4873	19.7052	19.7536	21.0000	(87)
Th 2	20.4963	20.4970	20.4977	20.5010	20.5016	20.5045	20.5045	20.5051	20.5034	20.5016	20.5004	20.4991	(88)
util rest of house	0.9389	0.9153	0.8838	0.8190	0.7233	0.5805	0.4428	0.4796	0.6676	0.8389	0.9149	0.9442	(89)
MIT 2	20.4963	19.8550	19.3869	19.0766	19.5728	20.1325	20.3692	20.3360	19.9468	18.9803	19.3225	20.4991	(90)
Living area fraction										fLA = Living area / (4) =		0.0355	(91)
MIT	20.5141	19.8717	19.4023	19.1006	19.5946	20.1508	20.3864	20.3532	19.9660	19.0060	19.3378	20.5168	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.5141	19.8717	19.4023	19.1006	19.5946	20.1508	20.3864	20.3532	19.9660	19.0060	19.3378	20.5168	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9390	0.9088	0.8669	0.7822	0.6852	0.5571	0.4320	0.4659	0.6352	0.7945	0.8999	0.9443	(94)
Useful gains	1313.2224	1459.8153	1496.4563	1472.7793	1335.2926	1070.7889	796.3137	814.1649	1051.3095	1181.9184	1242.2380	1265.0421	(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	3852.7727	3552.2141	3056.7192	2399.8905	1854.9306	1296.2908	884.2518	922.1615	1373.1295	1975.1066	2883.0332	3854.5926	(97)
Space heating kWh	1889.4254	1406.0920	1160.8356	667.5200	386.6106	0.0000	0.0000	0.0000	0.0000	590.1320	1181.3725	1926.6256	(98a)
Space heating requirement - total per year (kWh/year)												9208.6137	
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	1889.4254	1406.0920	1160.8356	667.5200	386.6106	0.0000	0.0000	0.0000	0.0000	590.1320	1181.3725	1926.6256	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9208.6137	
Space heating per m2										(98c) / (4) =		20.4182	(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 %)	318.8208 (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	1889.4254	1406.0920	1160.8356	667.5200	386.6106	0.0000	0.0000	0.0000	0.0000	590.1320	1181.3725	1926.6256	(98)
Space heating efficiency (main heating system 1)	318.8208	318.8208	318.8208	318.8208	318.8208	0.0000	0.0000	0.0000	0.0000	318.8208	318.8208	318.8208	(210)
Space heating fuel (main heating system)	592.6293	441.0289	364.1028	209.3715	121.2627	0.0000	0.0000	0.0000	0.0000	185.0983	370.5444	604.2973	(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												
	311.9801	275.7615	292.4546	255.7613	247.0328	221.6111	217.9221	227.0743	230.1335	257.8159	275.6305	308.3788 (64)
Efficiency of water heater												165.8885 (216)
(217)m	165.8885	165.8885	165.8885	165.8885	165.8885	165.8885	165.8885	165.8885	165.8885	165.8885	165.8885	165.8885 (217)
Fuel for water heating, kWh/month												
	188.0662	166.2331	176.2959	154.1767	148.9150	133.5904	131.3666	136.8837	138.7278	155.4152	166.1541	185.8952 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	106.1479	85.1558	76.6733	56.1742	43.3905	35.4504	39.5823	51.4506	66.8292	87.6835	99.0383	109.0980 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2888.3352 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	165.8885
Water heating fuel used	1881.7200 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	856.6740 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	5626.7292 (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	2888.3352	0.1553	448.4438	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1881.7200	0.1410	265.3244	(264)
Space and water heating			713.7681	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	856.6740	0.1443	123.6445	(268)
Total CO2, kg/year			837.4127	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.8600	(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	2888.3352	1.5748	4548.5094	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1881.7200	1.5214	2862.8028	(278)
Space and water heating			7411.3121	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	856.6740	1.5338	1313.9951	(282)
Total Primary energy kWh/year			8725.3073	(286)
Dwelling Primary energy Rate (DPER)			19.3500	(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	41.0000 (1b)	x	2.4000 (2b)	=	98.4000 (1b)	-
First floor	410.0000 (1c)	x	2.4000 (2c)	=	984.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	451.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1082.4000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0370 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2870 (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) =	0.2439 (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	0.3110	0.3049	0.2988	0.2683	0.2622	0.2317	0.2317	0.2256	0.2439	0.2622	0.2744	0.2866	(22b)
Effective ac	0.5484	0.5465	0.5446	0.5360	0.5344	0.5268	0.5268	0.5255	0.5297	0.5344	0.5376	0.5411	(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 Opening Type (Uw = 1.20)			20.6000	1.1450	23.5878			(27)
Heatloss Floor 1			41.0000	0.1300	5.3300			(28a)
External Wall 1	86.0000	20.6000	65.4000	0.1800	11.7720			(29a)
External Roof 1	41.0000		41.0000	0.1100	4.5100			(30)
Total net area of external elements Aum(A, m2)			168.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.1998			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 38.3703 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	18.0000	0.1600	2.8800
E6 Intermediate floor within a dwelling	18.0000	0.0000	0.0000
E16 Corner (normal)	9.6000	0.0900	0.8640
E18 Party wall between dwellings	9.6000	0.0600	0.5760
E2 Other lintels (including other steel lintels)	5.2000	0.0500	0.2600
E3 Sill	3.4500	0.0500	0.1725
E4 Jamb	8.9000	0.0500	0.4450
E11 Eaves (insulation at rafter level)	8.2000	0.0400	0.3280
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.1255 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	51.3253 (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	195.8686	195.1979	194.5404	191.4525	190.8747	188.1852	188.1852	187.6872	189.2212	190.8747	192.0435	193.2654	(38)
Heat transfer coeff	247.1939	246.5232	245.8657	242.7778	242.2000	239.5105	239.5105	239.0125	240.5465	242.2000	243.3688	244.5907	(39)
Average = Sum(39)m / 12 =												242.7750	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5481	0.5466	0.5452	0.5383	0.5370	0.5311	0.5311	0.5300	0.5334	0.5370	0.5396	0.5423	(40)
HLP (average)												0.5383	
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 3.3282 (42)

Hot water usage for mixer showers

80.0234	78.8208	77.0684	73.7155	71.2411	68.4817	66.9132	68.6524	70.5588	73.5216	76.9466	79.7168 (42a)

Hot water usage for baths

34.5359	34.0230	33.3007	31.9690	30.9718	29.8660	29.2688	29.9860	30.7669	31.9501	33.3093	34.4192 (42b)

Hot water usage for other uses

48.7144	46.9430	45.1715	43.4001	41.6287	39.8572	39.8572	41.6287	43.4001	45.1715	46.9430	48.7144 (42c)

Average daily hot water use (litres/day) 150.0850 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	163.2737	159.7868	155.5407	149.0846	143.8415	138.2050	136.0392	140.2671	144.7259	150.6432	157.1988	162.8504	(44)
Energy conte	258.5857	227.5343	239.0602	204.0893	193.6384	169.9391	164.5277	173.6799	178.4615	204.4215	223.9585	254.9844	(45)
Energy content (annual)											Total = Sum(45)m =	2492.8804	
Distribution loss (46)m = 0.15 x (45)m													
	38.7879	34.1301	35.8590	30.6134	29.0458	25.4909	24.6792	26.0520	26.7692	30.6632	33.5938	38.2477	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	305.1806	269.6200	285.6551	249.1811	240.2333	215.0310	211.1226	220.2748	223.5533	251.0164	269.0504	301.5793	(62)
WWHRS	-36.5834	-32.3546	-33.8799	-28.0539	-26.1452	-22.3727	-20.9708	-22.3003	-23.1476	-27.2885	-30.9145	-35.9059	(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													
	268.5972	237.2654	251.7752	221.1272	214.0880	192.6583	190.1518	197.9745	200.4057	223.7279	238.1358	265.6734	(64)
											Total per year (kWh/year) = Sum(64)m =	2701.5804	(64)
12Total per year (kWh/year)												2702	(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													
	123.2557	109.3237	116.7634	103.9332	101.6607	92.5782	91.9814	95.0245	95.4119	105.2461	110.5397	122.0582	(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	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	378.9843	419.5897	378.9843	391.6171	378.9843	391.6171	378.9843	378.9843	391.6171	378.9843	391.6171	378.9843	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	571.5124	577.4429	562.4982	530.6827	490.5214	452.7754	427.5588	421.6282	436.5729	468.3884	508.5498	546.2958	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	(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)													
	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	(71)
Water heating gains (Table 5)													
	165.6662	162.6841	156.9401	144.3516	136.6407	128.5809	123.6309	127.7211	132.5165	141.4598	153.5273	164.0567	(72)
Total internal gains													
	1192.0863	1235.6402	1174.3461	1142.5749	1082.0698	1045.8968	1003.0974	1001.2571	1033.6300	1064.7559	1129.6176	1165.2602	(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	
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
South	5.3000	46.7521	0.6300	0.7000	0.7700	75.7266	(78)
West	9.5000	19.6403	0.6300	0.7000	0.7700	57.0220	(80)

Solar gains	167.5621	303.6704	453.8378	610.0426	714.8701	720.3885	690.3193	612.5956	509.1236	346.9374	204.2699	140.9558	(83)
Total gains	1359.6484	1539.3106	1628.1839	1752.6175	1796.9399	1766.2853	1693.4167	1613.8526	1542.7536	1411.6933	1333.8876	1306.2160	(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	19.4461	19.4990	19.5511	19.7998	19.8470	20.0699	20.0699	20.1117	19.9834	19.8470	19.7517	19.6530	
alpha	2.2964	2.2999	2.3034	2.3200	2.3231	2.3380	2.3380	2.3408	2.3322	2.3231	2.3168	2.3102	
util living area	0.9463	0.9275	0.9034	0.8516	0.7734	0.6494	0.5247	0.5589	0.7250	0.8659	0.9265	0.9506	(86)
MIT	17.9462	18.2655	18.7439	19.4343	20.0643	20.5795	20.8199	20.7845	20.4112	19.5939	18.6764	17.9036	(87)
Th 2	20.4769	20.4783	20.4796	20.4858	20.4870	20.4924	20.4924	20.4934	20.4903	20.4870	20.4846	20.4822	(88)
util rest of house	0.9430	0.9231	0.8971	0.8412	0.7557	0.6187	0.4796	0.5152	0.6986	0.8546	0.9213	0.9475	(89)
MIT 2	16.7309	17.1379	17.7477	18.6250	19.4150	20.0470	20.3243	20.2876	19.8491	18.8334	17.6676	16.6791	(90)
Living area fraction										fLA = Living area / (4) =		0.0355	(91)
MIT	16.7740	17.1779	17.7830	18.6537	19.4381	20.0659	20.3419	20.3053	19.8690	18.8604	17.7034	16.7225	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.7740	17.1779	17.7830	18.6537	19.4381	20.0659	20.3419	20.3053	19.8690	18.8604	17.7034	16.7225	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9086	0.8837	0.8538	0.7954	0.7136	0.5905	0.4653	0.4977	0.6620	0.8091	0.8821	0.9149	(94)
Useful gains	1235.3455	1360.3550	1390.1428	1393.9678	1282.3759	1042.9926	787.9792	803.2763	1021.3800	1142.2551	1176.5622	1194.9936	(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	3083.4945	3026.7839	2774.1039	2367.9935	1874.1572	1309.1465	896.2268	933.4075	1387.7182	2000.6651	2580.5444	3062.8938	(97)
Space heating kWh	1375.0228	1119.8402	1029.6671	701.2985	440.2853	0.0000	0.0000	0.0000	0.0000	638.6571	1010.8673	1389.7177	(98a)
Space heating requirement - total per year (kWh/year)												7705.3560	
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	1375.0228	1119.8402	1029.6671	701.2985	440.2853	0.0000	0.0000	0.0000	0.0000	638.6571	1010.8673	1389.7177	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7705.3560	
Space heating per m2										(98c) / (4) =		17.0850	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1375.0228	1119.8402	1029.6671	701.2985	440.2853	0.0000	0.0000	0.0000	0.0000	638.6571	1010.8673	1389.7177	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	1489.7322	1213.2613	1115.5656	759.8034	477.0155	0.0000	0.0000	0.0000	0.0000	691.9362	1095.1975	1505.6530	(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	268.5972	237.2654	251.7752	221.1272	214.0880	192.6583	190.1518	197.9745	200.4057	223.7279	238.1358	265.6734	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.1930	87.0829	86.8749	86.4624	85.6400	79.8000	79.8000	79.8000	79.8000	86.2757	86.9307	87.2213	(217)
Fuel for water heating, kWh/month	308.0492	272.4592	289.8135	255.7497	249.9859	241.4264	238.2854	248.0883	251.1349	259.3175	273.9375	304.5970	(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	78.7454	63.1725	56.8799	41.6726	32.1891	26.2988	29.3640	38.1684	49.5770	65.0477	73.4713	80.9340	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.1662	-67.5546	-102.8450	-122.5526	-138.0756	-130.8677	-129.1767	-119.0167	-102.1493	-80.2066	-50.9883	-38.6035	(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	-14.8659	-32.1183	-65.5170	-100.9806	-136.1876	-137.9830	-136.4577	-114.3463	-82.2107	-46.8392	-20.1203	-11.6986	(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												8348.1647	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	79.8000
Water heating fuel used	3192.8445 (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)	635.5209 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2026.5277 (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	10236.0023 (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	8348.1647	0.2100	1753.1146	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3192.8445	0.2100	670.4973	(264)
Space and water heating			2423.6119	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	635.5209	0.1443	91.7253	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1127.2027	0.1334	-150.3916	
PV Unit electricity exported	-899.3251	0.1251	-112.5263	
Total			-262.9180	(269)
Total CO2, kg/year			2264.3485	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			5.0200	(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	8348.1647	1.1300	9433.4261	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3192.8445	1.1300	3607.9143	(278)
Space and water heating			13041.3403	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	635.5209	1.5338	974.7831	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1127.2027	1.4930	-1682.9503	
PV Unit electricity exported	-899.3251	0.4592	-413.0128	
Total			-2095.9631	(283)
Total Primary energy kWh/year			12050.2611	(286)
Target Primary Energy Rate (TPER)			26.7200	(287)

Full SAP Calculation Printout

Property Reference	House Type G	Issued on Date	05/10/2023
Assessment Reference	Plot 27	Prop Type Ref	
Property			

SAP Rating	81 B	DER	4.41	TER	9.51
Environmental	96 A	% DER < TER			53.63
CO_2 Emissions (t/year)	0.4	DFEE	33.95	TFEE	34.06
Compliance Check	See BREL	% DFEE < TFEE			0.33
% DPER < TPER	5.95	DPER	46.41	TPER	49.35

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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			51.0000 (1b)	x	2.4000 (2b)	=	122.4000 (1b)	-
First floor			48.0000 (1c)	x	2.4000 (2c)	=	115.2000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000							(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.6000	(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		1 * 10	=	10.0000 (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) =		10.0000 / (5)	=	0.0421 (8)
Pressure test		Yes		
Pressure Test Method		Blower Door		
Measured/design AP50		4.0000		(17)
Infiltration rate		0.2421		(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)	=	0.2058 (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	0.2624	0.2572	0.2521	0.2264	0.2212	0.1955	0.1955	0.1903	0.2058	0.2212	0.2315	0.2418	(22b)
Effective ac	0.5344	0.5331	0.5318	0.5256	0.5245	0.5191	0.5191	0.5181	0.5212	0.5245	0.5268	0.5292	(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	
Opening Type 1 (Uw = 1.20)			33.0000	1.1450	37.7863			(27)
Heatloss Floor 1			51.0000	0.1200	6.1200	110.0000	5610.0000	(28a)
External Wall 1	86.4000	33.0000	53.4000	0.1900	10.1460	190.0000	10146.0000	(29a)
External Roof 1	48.0000		48.0000	0.1500	7.2000	9.0000	432.0000	(30)
Total net area of external elements Aum(A, m2)			185.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	61.2523			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 16188.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.5152 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	23.0000	0.0670	1.5410
E6 Intermediate floor within a dwelling	23.0000	0.0020	0.0460
E16 Corner (normal)	9.6000	0.0410	0.3936
E18 Party wall between dwellings	9.6000	0.0400	0.3840
E2 Other lintels (including other steel lintels)	5.2000	0.0240	0.1248
E3 Sill	3.4500	0.0190	0.0655
E4 Jamb	8.9000	0.0140	0.1246
E11 Eaves (insulation at rafter level)	8.2000	0.0110	0.0902
E12 Gable (insulation at ceiling level)	10.0000	0.0330	0.3300

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.0998 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 64.3520 (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	41.9026	41.7978	41.6951	41.2126	41.1224	40.7022	40.7022	40.6244	40.8640	41.1224	41.3050	41.4959	(38)
Heat transfer coeff	106.2546	106.1498	106.0471	105.5646	105.4744	105.0542	105.0542	104.9764	105.2160	105.4744	105.6570	105.8479	(39)

Average = Sum(39)m / 12 = 105.5642

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0733	1.0722	1.0712	1.0663	1.0654	1.0612	1.0612	1.0604	1.0628	1.0654	1.0672	1.0692	(40)
HLP (average)												1.0663	
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 2.7301 (42)
Hot water usage for mixer showers

69.9941	68.9423	67.4095	64.4768	62.3125	59.8989	58.5270	60.0482	61.7157	64.3072	67.3029	69.7260	(42a)

Hot water usage for baths

30.2230	29.7741	29.1421	27.9766	27.1039	26.1363	25.6136	26.2413	26.9247	27.9601	29.1495	30.1208	(42b)

Hot water usage for other uses

42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887	(42c)

Average daily hot water use (litres/day) 131.2707 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	142.8058	139.7564	136.0429	130.3960	125.8104	120.8805	118.9860	122.6835	126.5831	131.7586	137.4924	142.4355	(44)
Energy conte	226.1695	199.0113	209.0928	178.5056	169.3650	148.6367	143.9032	151.9078	156.0896	178.7952	195.8832	223.0195	(45)

Energy content (annual) Total = Sum(45)m = 2180.3794
Distribution loss (46)m = 0.15 x (45)m

33.9254	29.8517	31.3639	26.7758	25.4047	22.2955	21.5855	22.7862	23.4134	26.8193	29.3825	33.4529	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

279.5639	247.2385	262.4872	230.1776	222.7594	200.3087	197.2976	205.3022	207.7616	232.1896	247.5552	276.4139	(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

279.5639	247.2385	262.4872	230.1776	222.7594	200.3087	197.2976	205.3022	207.7616	232.1896	247.5552	276.4139	(64)

Total per year (kWh/year) = Sum(64)m = 2809.0554 (64)
12Total per year (kWh/year) 2809 (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

117.9169	104.7530	112.2389	100.6907	99.0294	90.7593	90.5633	93.2249	93.2374	102.1649	106.4688	116.8695	(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	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	128.4674	142.2317	128.4674	132.7496	128.4674	132.7496	128.4674	128.4674	132.7496	128.4674	132.7496	128.4674	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	(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)	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)

Water heating gains (Table 5)

	158.4904	155.8825	150.8587	139.8482	133.1040	126.0546	121.7249	125.3022	129.4964	137.3184	147.8733	157.0827 (72)

Total internal gains

	605.6098	619.4092	593.9608	573.0537	544.1288	524.5397	504.6897	505.6241	520.7607	538.4795	571.2149	592.9640 (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	12.2000	10.6334	0.7600	0.7000	0.7700	47.8274 (74)
East	9.3000	19.6403	0.7600	0.7000	0.7700	67.3403 (76)
South	1.8000	46.7521	0.7600	0.7000	0.7700	31.0255 (78)
West	9.7000	19.6403	0.7600	0.7000	0.7700	70.2367 (80)

Solar gains	216.4298	411.3420	663.2554	969.0317	1204.4870	1244.0778	1179.6240	999.2803	769.8295	482.9508	267.3193	179.8167 (83)
Total gains	822.0396	1030.7512	1257.2162	1542.0854	1748.6159	1768.6175	1684.3138	1504.9043	1290.5903	1021.4302	838.5342	772.7807 (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	42.3197	42.3615	42.4026	42.5963	42.6328	42.8033	42.8033	42.8350	42.7375	42.6328	42.5591	42.4824	
alpha	3.8213	3.8241	3.8268	3.8398	3.8422	3.8536	3.8536	3.8557	3.8492	3.8422	3.8373	3.8322	
util living area	0.9709	0.9371	0.8642	0.7130	0.5325	0.3744	0.2731	0.3181	0.5339	0.8208	0.9465	0.9764	(86)
Living	19.5164	19.8705	20.3141	20.7292	20.9243	20.9846	20.9965	20.9937	20.9437	20.6063	19.9727	19.4427	
Non living	18.3120	18.7529	19.2904	19.7657	19.9663	20.0230	20.0312	20.0305	19.9917	19.6482	18.8904	18.2217	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2410	19.8705	20.3141	20.7292	20.9243	20.9846	20.9965	20.9937	20.9437	20.6063	19.9727	19.6605	(87)
Th 2	20.0227	20.0236	20.0244	20.0284	20.0292	20.0327	20.0327	20.0333	20.0313	20.0292	20.0277	20.0261	(88)
util rest of house	0.9651	0.9254	0.8415	0.6746	0.4840	0.3199	0.2137	0.2525	0.4679	0.7828	0.9344	0.9715	(89)
MIT 2	19.3407	18.7529	19.2904	19.7657	19.9663	20.0230	20.0312	20.0305	19.9917	19.6482	18.8904	18.5469	(90)
Living area fraction									fLA = Living area / (4) =			0.2626	(91)
MIT	19.5772	19.0464	19.5593	20.0188	20.2179	20.2755	20.2847	20.2835	20.2417	19.8998	19.1746	18.8394	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5772	19.0464	19.5593	20.0188	20.2179	20.2755	20.2847	20.2835	20.2417	19.8998	19.1746	18.8394	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9619	0.9112	0.8293	0.6742	0.4936	0.3337	0.2292	0.2696	0.4826	0.7771	0.9212	0.9639	(94)
Useful gains	790.7271	939.1758	1042.6302	1039.6564	863.2039	590.2192	386.0636	405.7382	622.8841	793.7690	772.4244	744.8817	(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	1623.2693	1501.6402	1384.8972	1173.7478	898.4171	596.2361	387.0960	407.6744	646.2092	980.8914	1275.7696	1549.5442	(97)
Space heating kWh	619.4114	377.9760	254.6466	96.5458	26.1986	0.0000	0.0000	0.0000	0.0000	139.2191	362.4085	598.6689	(98a)
Space heating requirement - total per year (kWh/year)												2475.0749	
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	619.4114	377.9760	254.6466	96.5458	26.1986	0.0000	0.0000	0.0000	0.0000	139.2191	362.4085	598.6689	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2475.0749	
Space heating per m2											(98c) / (4) =	25.0008	(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 %) 261.1634 (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	619.4114	377.9760	254.6466	96.5458	26.1986	0.0000	0.0000	0.0000	0.0000	139.2191	362.4085	598.6689	(98)
Space heating efficiency (main heating system 1)	261.1634	261.1634	261.1634	261.1634	261.1634	0.0000	0.0000	0.0000	0.0000	261.1634	261.1634	261.1634	(210)
Space heating fuel (main heating system)	237.1739	144.7278	97.5047	36.9676	10.0315	0.0000	0.0000	0.0000	0.0000	53.3073	138.7670	229.2315	(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

279.5639	247.2385	262.4872	230.1776	222.7594	200.3087	197.2976	205.3022	207.7616	232.1896	247.5552	276.4139 (64)

Efficiency of water heater

											159.9572 (216)
(217)m	159.9572	159.9572	159.9572	159.9572	159.9572	159.9572	159.9572	159.9572	159.9572	159.9572	159.9572 (217)

Fuel for water heating, kWh/month

174.7742	154.5654	164.0984	143.8995	139.2619	125.2264	123.3440	128.3482	129.8857	145.1573	154.7634	172.8050 (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 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	34.3173	27.5306	24.7883	18.1610	14.0281	11.4610	12.7969	16.6338	21.6057	28.3479	32.0188	35.2711 (232)

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

(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

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

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	947.7112 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	159.9572
Water heating fuel used	1756.1296 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	276.9606 (232)

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

PV generation	0.0000 (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	2980.8014 (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	947.7112	0.1571	148.9129	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1756.1296	0.1409	247.5032	(264)
Space and water heating			396.4161	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	276.9606	0.1443	39.9740	(268)
Total CO2, kg/year			436.3901	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4100	(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	947.7112	1.5816	1498.9290	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1756.1296	1.5211	2671.3100	(278)
Space and water heating			4170.2390	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	276.9606	1.5338	424.8113	(282)
Total Primary energy kWh/year			4595.0504	(286)
Dwelling Primary energy Rate (DPER)			46.4100	(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	51.0000 (1b)	x	2.4000 (2b)	=	122.4000 (1b)	-
First floor	48.0000 (1c)	x	2.4000 (2c)	=	115.2000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.6000	(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) =	0.1263 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3763 (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) =	0.3198 (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	0.4078	0.3998	0.3918	0.3518	0.3438	0.3038	0.3038	0.2958	0.3198	0.3438	0.3598	0.3758	(22b)
Effective ac	0.5831	0.5799	0.5767	0.5619	0.5591	0.5462	0.5462	0.5438	0.5511	0.5591	0.5647	0.5706	(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 Opening Type (Uw = 1.20)			24.7600	1.1450	28.3511			(27)
Heatloss Floor 1			51.0000	0.1300	6.6300			(28a)
External Wall 1	86.4000	24.7600	61.6400	0.1800	11.0952			(29a)
External Roof 1	48.0000		48.0000	0.1100	5.2800			(30)
Total net area of external elements Aum(A, m2)			185.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.3563			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.5152 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	23.0000	0.1600	3.6800
E6 Intermediate floor within a dwelling	23.0000	0.0000	0.0000
E16 Corner (normal)	9.6000	0.0900	0.8640
E18 Party wall between dwellings	9.6000	0.0600	0.5760
E2 Other lintels (including other steel lintels)	5.2000	0.0500	0.2600
E3 Sill	3.4500	0.0500	0.1725
E4 Jamb	8.9000	0.0500	0.4450
E11 Eaves (insulation at rafter level)	8.2000	0.0400	0.3280
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.9255 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =		58.2818 (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	45.7228	45.4697	45.2216	44.0562	43.8381	42.8231	42.8231	42.6351	43.2141	43.8381	44.2792	44.7404	(38)
Heat transfer coeff	104.0047	103.7516	103.5034	102.3380	102.1200	101.1049	101.1049	100.9169	101.4959	102.1200	102.5611	103.0222	(39)
Average = Sum(39)m / 12 =												102.3370	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0506	1.0480	1.0455	1.0337	1.0315	1.0213	1.0213	1.0194	1.0252	1.0315	1.0360	1.0406	(40)
HLP (average)												1.0337	
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 2.7301 (42)

Hot water usage for mixer showers

69.9941	68.9423	67.4095	64.4768	62.3125	59.8989	58.5270	60.0482	61.7157	64.3072	67.3029	69.7260 (42a)

Hot water usage for baths

30.2230	29.7741	29.1421	27.9766	27.1039	26.1363	25.6136	26.2413	26.9247	27.9601	29.1495	30.1208 (42b)

Hot water usage for other uses

42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887 (42c)

Average daily hot water use (litres/day) 131.2707 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	142.8058	139.7564	136.0429	130.3960	125.8104	120.8805	118.9860	122.6835	126.5831	131.7586	137.4924	142.4355	(44)
Energy conte	226.1695	199.0113	209.0928	178.5056	169.3650	148.6367	143.9032	151.9078	156.0896	178.7952	195.8832	223.0195	(45)
Energy content (annual)										Total = Sum(45)m =		2180.3794	
Distribution loss (46)m = 0.15 x (45)m													
	33.9254	29.8517	31.3639	26.7758	25.4047	22.2955	21.5855	22.7862	23.4134	26.8193	29.3825	33.4529	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	272.7644	241.0970	255.6877	223.5975	215.9599	193.7285	190.4981	198.5027	201.1814	225.3901	240.9750	269.6144	(62)
WWHRS	-31.9984	-28.2996	-29.6338	-24.5379	-22.8685	-19.5687	-18.3425	-19.5055	-20.2465	-23.8684	-27.0400	-31.4058	(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													
	240.7660	212.7973	226.0540	199.0596	193.0914	174.1598	172.1556	178.9972	180.9349	201.5217	213.9350	238.2086	(64)
										Total per year (kWh/year) = Sum(64)m =		2431.6811	(64)
12Total per year (kWh/year)												2432	(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													
	112.4773	99.8398	106.7993	95.4266	93.5898	85.4952	85.1237	87.7853	87.9733	96.7253	101.2046	111.4299	(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	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	128.4674	142.2317	128.4674	132.7496	128.4674	132.7496	128.4674	128.4674	132.7496	128.4674	132.7496	128.4674	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	(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)													
	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)
Water heating gains (Table 5)													
	151.1792	148.5712	143.5474	132.5369	125.7927	118.7433	114.4136	117.9909	122.1851	130.0072	140.5620	149.7714	(72)
Total internal gains													
	601.2985	615.0979	589.6495	568.7424	539.8176	517.2284	497.3785	498.3128	513.4494	534.1682	566.9036	588.6527	(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	9.1500	10.6334	0.6300	0.7000	0.7700	29.7348	(74)
East	6.9800	19.6403	0.6300	0.7000	0.7700	41.8962	(76)
South	1.3500	46.7521	0.6300	0.7000	0.7700	19.2889	(78)
West	7.2800	19.6403	0.6300	0.7000	0.7700	43.6969	(80)

Solar gains	134.6167	255.8531	412.5462	602.7392	749.1879	773.8101	733.7215	621.5524	478.8360	300.3949	166.2701	111.8433	(83)
Total gains	735.9153	870.9510	1002.1958	1171.4816	1289.0055	1291.0385	1231.1000	1119.8652	992.2855	834.5631	733.1737	700.4960	(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	43.2352	43.3407	43.4446	43.9394	44.0332	44.4753	44.4753	44.5581	44.3039	44.0332	43.8438	43.6475	
alpha	3.8823	3.8894	3.8963	3.9293	3.9355	3.9650	3.9650	3.9705	3.9536	3.9355	3.9229	3.9098	
util living area	0.9791	0.9603	0.9200	0.8186	0.6619	0.4845	0.3572	0.4071	0.6421	0.8808	0.9628	0.9825	(86)
MIT	19.4466	19.7244	20.1142	20.5712	20.8518	20.9668	20.9922	20.9871	20.9028	20.4977	19.8958	19.4024	(87)
Th 2	20.0414	20.0435	20.0456	20.0553	20.0572	20.0657	20.0657	20.0672	20.0624	20.0572	20.0535	20.0496	(88)
util rest of house	0.9748	0.9524	0.9044	0.7867	0.6113	0.4194	0.2832	0.3277	0.5730	0.8511	0.9540	0.9788	(89)
MIT 2	18.2374	18.5879	19.0723	19.6220	19.9281	20.0437	20.0622	20.0612	19.9902	19.5536	18.8150	18.1870	(90)
Living area fraction										fLA = Living area / (4) =		0.2626	(91)
MIT	18.5549	18.8864	19.3459	19.8713	20.1707	20.2861	20.3065	20.3044	20.2298	19.8016	19.0989	18.5062	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5549	18.8864	19.3459	19.8713	20.1707	20.2861	20.3065	20.3044	20.2298	19.8016	19.0989	18.5062	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9657	0.9402	0.8908	0.7799	0.6177	0.4351	0.3025	0.3482	0.5860	0.8417	0.9425	0.9706	(94)
Useful gains	710.6565	818.8447	892.7427	913.5988	796.2088	561.7624	372.4043	389.9569	581.4761	702.4859	691.0210	679.9053	(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	1482.5791	1451.1114	1329.5995	1122.7778	865.0281	574.8977	374.7438	394.0155	622.1535	939.6638	1230.6170	1473.8580	(97)
Space heating kWh	574.3104	424.8832	325.0214	150.6089	51.2015	0.0000	0.0000	0.0000	0.0000	176.4604	388.5091	590.7009	(98a)
Space heating requirement - total per year (kWh/year)												2681.6959	
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	574.3104	424.8832	325.0214	150.6089	51.2015	0.0000	0.0000	0.0000	0.0000	176.4604	388.5091	590.7009	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2681.6959	
Space heating per m2											(98c) / (4) =	27.0878	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	574.3104	424.8832	325.0214	150.6089	51.2015	0.0000	0.0000	0.0000	0.0000	176.4604	388.5091	590.7009	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	622.2214	460.3285	352.1359	163.1733	55.4730	0.0000	0.0000	0.0000	0.0000	191.1814	420.9199	639.9793	(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	240.7660	212.7973	226.0540	199.0596	193.0914	174.1598	172.1556	178.9972	180.9349	201.5217	213.9350	238.2086	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9370	85.5791	84.8734	83.4426	81.5319	79.8000	79.8000	79.8000	79.8000	83.7633	85.3805	86.0123	(217)
Fuel for water heating, kWh/month	280.1656	248.6556	266.3424	238.5587	236.8292	218.2454	215.7338	224.3073	226.7354	240.5846	250.5666	276.9472	(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	26.6930	21.4141	19.2810	14.1261	10.9114	8.9147	9.9538	12.9383	16.8055	22.0498	24.9052	27.4349	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-46.3462	-64.6534	-91.9656	-102.2788	-109.3270	-101.6637	-100.3504	-95.1619	-85.9229	-73.3366	-50.6846	-40.1453	(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	-28.3279	-59.3299	-117.4603	-175.7747	-231.8296	-232.7602	-230.0729	-195.1189	-143.4029	-84.6959	-37.7676	-22.4256	(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												2905.4126	(211)

Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2923.6719 (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)	215.4276 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2520.8028 (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	3609.7094 (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	2905.4126	0.2100	610.1367	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2923.6719	0.2100	613.9711	(264)
Space and water heating			1224.1078	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	215.4276	0.1443	31.0929	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-961.8364	0.1348	-129.6768	
PV Unit electricity exported	-1558.9664	0.1260	-196.4283	
Total			-326.1052	(269)
Total CO2, kg/year			941.0247	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5100	(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	2905.4126	1.1300	3283.1163	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2923.6719	1.1300	3303.7492	(278)
Space and water heating			6586.8655	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	215.4276	1.5338	330.4301	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-961.8364	1.4983	-1441.1127	
PV Unit electricity exported	-1558.9664	0.4625	-721.0338	
Total			-2162.1465	(283)
Total Primary energy kWh/year			4885.2499	(286)
Target Primary Energy Rate (TPER)			49.3500	(287)

Full SAP Calculation Printout

Property Reference	House Type E	Issued on Date	05/10/2023
Assessment Reference	Plot 28	Prop Type Ref	
Property			

SAP Rating	82 B	DER	4.07	TER	8.97
Environmental	96 A	% DER < TER			54.63
CO_2 Emissions (t/year)	0.37	DFEE	26.38	TFEE	29.76
Compliance Check	See BREL	% DFEE < TFEE			11.35
% DPER < TPER	7.93	DPER	42.93	TPER	46.63

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
Client			

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

---
1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
First floor		50.0000 (1c)	x	2.4000 (2c)	=	120.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.0000	(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		1 * 10	=	10.0000 (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) =		10.0000 / (5)	=	0.0417 (8)
Pressure test				Yes
Pressure Test Method				Blower Door
Measured/design AP50				4.0000 (17)
Infiltration rate				0.2417 (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)	=	0.2054 (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	0.2619	0.2568	0.2516	0.2260	0.2208	0.1951	0.1951	0.1900	0.2054	0.2208	0.2311	0.2414	(22b)
Effective ac	0.5343	0.5330	0.5317	0.5255	0.5244	0.5190	0.5190	0.5181	0.5211	0.5244	0.5267	0.5291	(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	
Opening Type 1 (Uw = 1.20)			10.6000	1.1450	12.1374			(27)
Heatloss Floor 1			50.0000	0.1200	6.0000	110.0000	5500.0000	(28a)
External Wall 1	100.0000	10.6000	89.4000	0.1900	16.9860	190.0000	16986.0000	(29a)
External Roof 1	50.0000		50.0000	0.1500	7.5000	9.0000	450.0000	(30)
Total net area of external elements Aum(A, m2)			200.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.6234			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 22936.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 229.3600 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E5	Ground floor (normal)	21.0000	0.0670	1.4070
E6	Intermediate floor within a dwelling	21.0000	0.0020	0.0420
E16	Corner (normal)	9.6000	0.0410	0.3936
E18	Party wall between dwellings	9.6000	0.0420	0.4032
E2	Other lintels (including other steel lintels)	14.0500	0.0240	0.3372
E3	Sill	10.8000	0.0190	0.2052
E4	Jamb	32.9000	0.0140	0.4606
E10	Eaves (insulation at ceiling level)	11.0000	0.0460	0.5060
E12	Gable (insulation at ceiling level)	10.0000	0.0330	0.3300

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.0848 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.7082 (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	42.3164	42.2109	42.1075	41.6219	41.5310	41.1080	41.1080	41.0297	41.2710	41.5310	41.7148	41.9070	(38)
Heat transfer coeff	89.0246	88.9191	88.8157	88.3301	88.2392	87.8162	87.8162	87.7379	87.9792	88.2392	88.4230	88.6152	(39)

Average = Sum(39)m / 12 = 88.3296

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8902	0.8892	0.8882	0.8833	0.8824	0.8782	0.8782	0.8774	0.8798	0.8824	0.8842	0.8862	(40)
HLP (average)												0.8833	
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 2.7395 (42)
Hot water usage for mixer showers

70.1526	69.0984	67.5621	64.6228	62.4536	60.0345	58.6596	60.1842	61.8555	64.4528	67.4553	69.8838	(42a)

Hot water usage for baths

30.2911	29.8413	29.2078	28.0397	27.1651	26.1952	25.6714	26.3005	26.9854	28.0232	29.2153	30.1887	(42b)

Hot water usage for other uses

42.6855	41.1333	39.5811	38.0289	36.4767	34.9245	34.9245	36.4767	38.0289	39.5811	41.1333	42.6855	(42c)

Average daily hot water use (litres/day) 131.5680 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.1293	140.0729	136.3510	130.6913	126.0953	121.1543	119.2554	122.9613	126.8698	132.0570	137.8038	142.7581	(44)
Energy conte	226.6818	199.4620	209.5664	178.9099	169.7486	148.9733	144.2291	152.2518	156.4431	179.2001	196.3268	223.5246	(45)
Energy content (annual)										Total = Sum(45)m =		2185.3176	
Distribution loss (46)m = 0.15 x (45)m	34.0023	29.9193	31.4350	26.8365	25.4623	22.3460	21.6344	22.8378	23.4665	26.8800	29.4490	33.5287	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

280.0762	247.6892	262.9608	230.5819	223.1430	200.6453	197.6235	205.6462	208.1151	232.5945	247.9988	276.9190	(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

280.0762	247.6892	262.9608	230.5819	223.1430	200.6453	197.6235	205.6462	208.1151	232.5945	247.9988	276.9190	(64)

Total per year (kWh/year) = Sum(64)m = 2813.9936 (64)
12Total per year (kWh/year) 2814 (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

118.0872	104.9029	112.3963	100.8251	99.1569	90.8712	90.6717	93.3392	93.3549	102.2996	106.6163	117.0375	(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	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.4525	163.2510	147.4525	152.3676	147.4525	152.3676	147.4525	147.4525	152.3676	147.4525	152.3676	147.4525	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	256.3278	258.9876	252.2848	238.0153	220.0027	203.0733	191.7634	189.1036	195.8064	210.0759	228.0885	245.0179	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	(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)	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	(71)

Water heating gains (Table 5)

	158.7194	156.1055	151.0703	140.0349	133.2754	126.2100	121.8706	125.4560	129.6596	137.4994	148.0782	157.3084 (72)

Total internal gains

	626.5925	642.4370	614.9006	594.5108	564.8235	545.7438	525.1794	526.1049	541.9265	559.1207	592.6272	613.8717 (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
South	5.9000	46.7521	0.7600	0.7000	0.7700	101.6945 (78)
West	4.7000	19.6403	0.7600	0.7000	0.7700	34.0322 (80)

Solar gains	135.7268	233.1237	321.7927	399.6814	445.8307	441.0668	425.9299	392.2175	349.1342	258.6351	162.9769	115.8599 (83)
Total gains	762.3193	875.5607	936.6933	994.1922	1010.6542	986.8106	951.1093	918.3224	891.0607	817.7558	755.6041	729.7316 (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	71.5658	71.6507	71.7341	72.1285	72.2027	72.5505	72.5505	72.6153	72.4161	72.2027	72.0526	71.8964	
alpha	5.7711	5.7767	5.7823	5.8086	5.8135	5.8367	5.8367	5.8410	5.8277	5.8135	5.8035	5.7931	
util living area													
	0.9896	0.9765	0.9511	0.8821	0.7520	0.5602	0.4050	0.4375	0.6563	0.8976	0.9762	0.9917	(86)
Living	20.1154	20.3033	20.5203	20.7680	20.9266	20.9888	20.9986	20.9977	20.9730	20.7778	20.4056	20.0751	
Non living	19.1510	19.3879	19.6571	19.9530	20.1221	20.1796	20.1856	20.1859	20.1671	19.9706	19.5221	19.1027	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5475	20.3033	20.5203	20.7680	20.9266	20.9888	20.9986	20.9977	20.9730	20.7778	20.4056	20.2045	(87)
Th 2	20.1758	20.1767	20.1776	20.1817	20.1825	20.1861	20.1861	20.1868	20.1847	20.1825	20.1809	20.1793	(88)
util rest of house													
	0.9867	0.9704	0.9385	0.8541	0.7021	0.4928	0.3308	0.3612	0.5881	0.8671	0.9690	0.9895	(89)
MIT 2	19.7673	19.3879	19.6571	19.9530	20.1221	20.1796	20.1856	20.1859	20.1671	19.9706	19.5221	19.2967	(90)
Living area fraction										fLA = Living area / (4) =		0.2500	(91)
MIT	19.9623	19.6168	19.8729	20.1567	20.3232	20.3819	20.3888	20.3889	20.3686	20.1724	19.7430	19.5237	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9623	19.6168	19.8729	20.1567	20.3232	20.3819	20.3888	20.3889	20.3686	20.1724	19.7430	19.5237	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9859	0.9652	0.9331	0.8532	0.7111	0.5093	0.3493	0.3803	0.6040	0.8667	0.9641	0.9871	(94)
Useful gains	751.5421	845.1275	874.0083	848.2209	718.6968	502.5896	332.2495	349.1997	538.1700	708.7311	728.5018	720.3479	(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													
	1394.3298	1308.6010	1187.7216	994.3085	760.9060	507.7423	332.7205	349.9744	551.5062	844.6617	1117.9340	1357.9084	(97)
Space heating kWh													
	478.2340	311.4541	233.4027	105.1830	31.4036	0.0000	0.0000	0.0000	0.0000	101.1324	280.3912	474.3450	(98a)
Space heating requirement - total per year (kWh/year)												2015.5461	
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													
	478.2340	311.4541	233.4027	105.1830	31.4036	0.0000	0.0000	0.0000	0.0000	101.1324	280.3912	474.3450	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2015.5461	
Space heating per m2											(98c) / (4) =	20.1555	(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 %)	253.3850	(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													
	478.2340	311.4541	233.4027	105.1830	31.4036	0.0000	0.0000	0.0000	0.0000	101.1324	280.3912	474.3450	(98)
Space heating efficiency (main heating system 1)													
	253.3850	253.3850	253.3850	253.3850	253.3850	0.0000	0.0000	0.0000	0.0000	253.3850	253.3850	253.3850	(210)
Space heating fuel (main heating system)													
	188.7381	122.9174	92.1139	41.5112	12.3936	0.0000	0.0000	0.0000	0.0000	39.9125	110.6582	187.2033	(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												
	280.0762	247.6892	262.9608	230.5819	223.1430	200.6453	197.6235	205.6462	208.1151	232.5945	247.9988	276.9190 (64)
Efficiency of water heater												167.9964 (216)
(217)m	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964 (217)
Fuel for water heating, kWh/month												
	166.7156	147.4372	156.5276	137.2541	132.8261	119.4343	117.6356	122.4111	123.8807	138.4521	147.6215	164.8363 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	39.4133	31.6188	28.4692	20.8578	16.1111	13.1629	14.6971	19.1039	24.8141	32.5574	36.7735	40.5087 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	795.4481 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	167.9964
Water heating fuel used	1675.0323 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	318.0878 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	2788.5682 (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	795.4481	0.1568	124.7482	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1675.0323	0.1409	236.0755	(264)
Space and water heating			360.8237	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	318.0878	0.1443	45.9099	(268)
Total CO2, kg/year			406.7336	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0700	(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	795.4481	1.5806	1257.2497	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1675.0323	1.5211	2547.9571	(278)
Space and water heating			3805.2068	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	318.0878	1.5338	487.8938	(282)
Total Primary energy kWh/year			4293.1006	(286)
Dwelling Primary energy Rate (DPER)			42.9300	(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	50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
First floor	50.0000 (1c)	x	2.4000 (2c)	=	120.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.0000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80	=	0.0000 (6a)
Number of open flues	0 * 20	=	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10	=	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20	=	0.0000 (6d)
Number of flues attached to other heater	0 * 35	=	0.0000 (6e)
Number of blocked chimneys	0 * 20	=	0.0000 (6f)
Number of intermittent extract fans	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)	=	0.1250 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3750 (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)	=	0.3187 (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	0.4064	0.3984	0.3905	0.3506	0.3427	0.3028	0.3028	0.2948	0.3187	0.3427	0.3586	0.3745	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5458	0.5458	0.5435	0.5508	0.5587	0.5643	0.5701	(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 Opening Type (Uw = 1.20)			10.6000	1.1450	12.1374			(27)
Heatloss Floor 1			50.0000	0.1300	6.5000			(28a)
External Wall 1	100.0000	10.6000	89.4000	0.1800	16.0920			(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000			(30)
Total net area of external elements Aum(A, m2)			200.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.2294			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 229.3600 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	21.0000	0.1600	3.3600
E6 Intermediate floor within a dwelling	21.0000	0.0000	0.0000
E16 Corner (normal)	9.6000	0.0900	0.8640
E18 Party wall between dwellings	9.6000	0.0600	0.5760
E2 Other lintels (including other steel lintels)	14.0500	0.0500	0.7025
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	32.9000	0.0500	1.6450
E10 Eaves (insulation at ceiling level)	11.0000	0.0600	0.6600
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9475 (36)
Point Thermal bridges	(36a)	=	0.0000
Total fabric heat loss	(33) + (36) + (36a)	=	49.1769 (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	46.1406	45.8866	45.6376	44.4683	44.2496	43.2311	43.2311	43.0425	43.6234	44.2496	44.6921	45.1548	(38)
Heat transfer coeff	95.3175	95.0635	94.8146	93.6452	93.4265	92.4080	92.4080	92.2194	92.8003	93.4265	93.8690	94.3317	(39)
Average = Sum(39)m / 12 =												93.6442	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9532	0.9506	0.9481	0.9365	0.9343	0.9241	0.9241	0.9222	0.9280	0.9343	0.9387	0.9433	(40)
HLP (average)												0.9364	
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												2.7395	(42)
Hot water usage for mixer showers													
	70.1526	69.0984	67.5621	64.6228	62.4536	60.0345	58.6596	60.1842	61.8555	64.4528	67.4553	69.8838	(42a)
Hot water usage for baths													
	30.2911	29.8413	29.2078	28.0397	27.1651	26.1952	25.6714	26.3005	26.9854	28.0232	29.2153	30.1887	(42b)
Hot water usage for other uses													
	42.6855	41.1333	39.5811	38.0289	36.4767	34.9245	34.9245	36.4767	38.0289	39.5811	41.1333	42.6855	(42c)
Average daily hot water use (litres/day)												131.5680	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	143.1293	140.0729	136.3510	130.6913	126.0953	121.1543	119.2554	122.9613	126.8698	132.0570	137.8038	142.7581	(44)
Energy conte	226.6818	199.4620	209.5664	178.9099	169.7486	148.9733	144.2291	152.2518	156.4431	179.2001	196.3268	223.5246	(45)
Energy content (annual)										Total = Sum(45)m =		2185.3176	
Distribution loss (46)m = 0.15 x (45)m													
	34.0023	29.9193	31.4350	26.8365	25.4623	22.3460	21.6344	22.8378	23.4665	26.8800	29.4490	33.5287	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	273.2767	241.5477	256.1613	224.0018	216.3435	194.0651	190.8240	198.8467	201.5349	225.7950	241.4187	270.1195	(62)
WWHRS	-32.0709	-28.3637	-29.7009	-24.5935	-22.9202	-19.6130	-18.3841	-19.5496	-20.2924	-23.9225	-27.1013	-31.4769	(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													
	241.2058	213.1840	226.4604	199.4083	193.4232	174.4521	172.4399	179.2971	181.2426	201.8726	214.3174	238.6426	(64)
										Total per year (kWh/year) = Sum(64)m =		2435.9460	(64)
12Total per year (kWh/year)												2436	(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													
	112.6476	99.9897	106.9567	95.5610	93.7173	85.6071	85.2321	87.8997	88.0908	96.8600	101.3521	111.5979	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	147.4525	163.2510	147.4525	152.3676	147.4525	152.3676	147.4525	147.4525	152.3676	147.4525	152.3676	147.4525	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	256.3278	258.9876	252.2848	238.0153	220.0027	203.0733	191.7634	189.1036	195.8064	210.0759	228.0885	245.0179	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	(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)													
	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	(71)
Water heating gains (Table 5)													
	151.4081	148.7942	143.7591	132.7236	125.9641	118.8987	114.5593	118.1447	122.3483	130.1881	140.7669	149.9971	(72)
Total internal gains													
	622.2812	638.1257	610.5893	590.1995	560.5122	538.4325	517.8681	518.7936	534.6152	554.8094	588.3159	609.5604	(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	
South	5.9000	46.7521	0.6300	0.7000	0.7700	84.2994	(78)
West	4.7000	19.6403	0.6300	0.7000	0.7700	28.2109	(80)

Solar gains	112.5103	193.2473	266.7492	331.3149	369.5702	365.6211	353.0735	325.1277	289.4139	214.3949	135.0993	96.0417	(83)
Total gains	734.7916	831.3730	877.3385	921.5143	930.0824	904.0536	870.9416	843.9213	824.0291	769.2043	723.4151	705.6022	(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	66.8410	67.0195	67.1955	68.0345	68.1939	68.9454	68.9454	69.0864	68.6540	68.1939	67.8723	67.5394	

alpha	5.4561	5.4680	5.4797	5.5356	5.5463	5.5964	5.5964	5.6058	5.5769	5.5463	5.5248	5.5026	
util living area													
	0.9920	0.9834	0.9674	0.9197	0.8170	0.6318	0.4633	0.4973	0.7247	0.9272	0.9825	0.9935	(86)
MIT	19.9710	20.1494	20.3719	20.6583	20.8695	20.9757	20.9963	20.9946	20.9482	20.6906	20.2895	19.9440	(87)
Th 2	20.1225	20.1247	20.1268	20.1366	20.1385	20.1471	20.1471	20.1487	20.1438	20.1385	20.1347	20.1308	(88)
util rest of house													
	0.9898	0.9789	0.9581	0.8972	0.7695	0.5565	0.3754	0.4080	0.6530	0.9022	0.9768	0.9917	(89)
MIT 2	18.9276	19.1548	19.4352	19.7904	20.0269	20.1325	20.1458	20.1466	20.1087	19.8355	19.3414	18.8995	(90)
Living area fraction										fLA = Living area / (4) =		0.2500	(91)
MIT	19.1884	19.4034	19.6694	20.0074	20.2375	20.3433	20.3584	20.3586	20.3186	20.0493	19.5784	19.1606	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1884	19.4034	19.6694	20.0074	20.2375	20.3433	20.3584	20.3586	20.3186	20.0493	19.5784	19.1606	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9865	0.9740	0.9521	0.8933	0.7755	0.5744	0.3974	0.4303	0.6685	0.8991	0.9721	0.9889	(94)
Useful gains	724.8832	809.7884	835.3537	823.1975	721.2368	519.2607	346.0859	363.1608	550.8469	691.6043	703.2444	697.7351	(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													
	1419.1252	1378.7447	1248.6524	1040.1533	797.6323	530.7243	347.3057	365.0567	577.0893	882.8160	1171.3387	1411.2585	(97)
Space heating kWh													
	516.5161	382.3386	307.4942	156.2081	56.8382	0.0000	0.0000	0.0000	0.0000	142.2615	337.0279	530.8614	(98a)
Space heating requirement - total per year (kWh/year)												2429.5462	
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													
	516.5161	382.3386	307.4942	156.2081	56.8382	0.0000	0.0000	0.0000	0.0000	142.2615	337.0279	530.8614	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2429.5462	
Space heating per m2											(98c) / (4) =	24.2955	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	516.5161	382.3386	307.4942	156.2081	56.8382	0.0000	0.0000	0.0000	0.0000	142.2615	337.0279	530.8614	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	559.6057	414.2347	333.1465	169.2396	61.5799	0.0000	0.0000	0.0000	0.0000	154.1295	365.1440	575.1478	(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													
	241.2058	213.1840	226.4604	199.4083	193.4232	174.4521	172.4399	179.2971	181.2426	201.8726	214.3174	238.6426	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7224	85.3540	84.7463	83.5182	81.6802	79.8000	79.8000	79.8000	79.8000	83.2896	85.0705	85.7990	(217)
Fuel for water heating, kWh/month													
	281.3801	249.7646	267.2215	238.7603	236.8057	218.6117	216.0901	224.6831	227.1210	242.3742	251.9292	278.1413	(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	30.6377	24.5787	22.1304	16.2137	12.5239	10.2321	11.4247	14.8503	19.2891	25.3083	28.5857	31.4892	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.8440	-64.1351	-91.4528	-101.9369	-109.1268	-101.5301	-100.2579	-95.0489	-85.7174	-72.9317	-50.2198	-39.6919	(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	-27.3659	-57.4172	-113.8667	-170.6646	-225.3404	-226.3366	-223.6865	-189.5402	-139.1118	-82.0022	-36.4980	-21.6521	(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												2632.2277	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2932.8828	(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)	247.2639 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2471.3753 (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	3426.9992 (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	2632.2277	0.2100	552.7678	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2932.8828	0.2100	615.9054	(264)
Space and water heating			1168.6732	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	247.2639	0.1443	35.6878	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-957.8931	0.1348	-129.0951	
PV Unit electricity exported	-1513.4822	0.1260	-190.6306	
Total			-319.7256	(269)
Total CO2, kg/year			896.5647	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.9700	(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	2632.2277	1.1300	2974.4173	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2932.8828	1.1300	3314.1576	(278)
Space and water heating			6288.5749	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	247.2639	1.5338	379.2617	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-957.8931	1.4981	-1435.0167	
PV Unit electricity exported	-1513.4822	0.4623	-699.7488	
Total			-2134.7655	(283)
Total Primary energy kWh/year			4663.1719	(286)
Target Primary Energy Rate (TPER)			46.6300	(287)

Full SAP Calculation Printout

Property Reference	House Type E	Issued on Date	05/10/2023
Assessment Reference	Plot 29	Prop Type Ref	
Property			

SAP Rating	82 B	DER	4.07	TER	8.97
Environmental	96 A	% DER < TER			54.63
CO_2 Emissions (t/year)	0.37	DFEE	26.38	TFEE	29.76
Compliance Check	See BREL	% DFEE < TFEE			11.35
% DPER < TPER	7.93	DPER	42.93	TPER	46.63

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
Client			

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

---
1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
First floor		50.0000 (1c)	x	2.4000 (2c)	=	120.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.0000	(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	1 * 10 =	10.0000 (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) =	10.0000 / (5) =	0.0417 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2417 (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) =	0.2054 (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	0.2619	0.2568	0.2516	0.2260	0.2208	0.1951	0.1951	0.1900	0.2054	0.2208	0.2311	0.2414	(22b)
Effective ac	0.5343	0.5330	0.5317	0.5255	0.5244	0.5190	0.5190	0.5181	0.5211	0.5244	0.5267	0.5291	(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	
Opening Type 1 (Uw = 1.20)			10.6000	1.1450	12.1374			(27)
Heatloss Floor 1			50.0000	0.1200	6.0000	110.0000	5500.0000	(28a)
External Wall 1	100.0000	10.6000	89.4000	0.1900	16.9860	190.0000	16986.0000	(29a)
External Roof 1	50.0000		50.0000	0.1500	7.5000	9.0000	450.0000	(30)
Total net area of external elements Aum(A, m2)			200.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.6234			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 22936.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 229.3600 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E5	Ground floor (normal)	21.0000	0.0670	1.4070
E6	Intermediate floor within a dwelling	21.0000	0.0020	0.0420
E16	Corner (normal)	9.6000	0.0410	0.3936
E18	Party wall between dwellings	9.6000	0.0420	0.4032
E2	Other lintels (including other steel lintels)	14.0500	0.0240	0.3372
E3	Sill	10.8000	0.0190	0.2052
E4	Jamb	32.9000	0.0140	0.4606
E10	Eaves (insulation at ceiling level)	11.0000	0.0460	0.5060
E12	Gable (insulation at ceiling level)	10.0000	0.0330	0.3300

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.0848 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.7082 (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	42.3164	42.2109	42.1075	41.6219	41.5310	41.1080	41.1080	41.0297	41.2710	41.5310	41.7148	41.9070	(38)
Heat transfer coeff	89.0246	88.9191	88.8157	88.3301	88.2392	87.8162	87.8162	87.7379	87.9792	88.2392	88.4230	88.6152	(39)

Average = Sum(39)m / 12 = 88.3296

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8902	0.8892	0.8882	0.8833	0.8824	0.8782	0.8782	0.8774	0.8798	0.8824	0.8842	0.8862	(40)
HLP (average)												0.8833	
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 2.7395 (42)
Hot water usage for mixer showers

70.1526	69.0984	67.5621	64.6228	62.4536	60.0345	58.6596	60.1842	61.8555	64.4528	67.4553	69.8838	(42a)

Hot water usage for baths

30.2911	29.8413	29.2078	28.0397	27.1651	26.1952	25.6714	26.3005	26.9854	28.0232	29.2153	30.1887	(42b)

Hot water usage for other uses

42.6855	41.1333	39.5811	38.0289	36.4767	34.9245	34.9245	36.4767	38.0289	39.5811	41.1333	42.6855	(42c)

Average daily hot water use (litres/day) 131.5680 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.1293	140.0729	136.3510	130.6913	126.0953	121.1543	119.2554	122.9613	126.8698	132.0570	137.8038	142.7581	(44)
Energy conte	226.6818	199.4620	209.5664	178.9099	169.7486	148.9733	144.2291	152.2518	156.4431	179.2001	196.3268	223.5246	(45)
Energy content (annual)										Total = Sum(45)m =		2185.3176	
Distribution loss (46)m = 0.15 x (45)m	34.0023	29.9193	31.4350	26.8365	25.4623	22.3460	21.6344	22.8378	23.4665	26.8800	29.4490	33.5287	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

280.0762	247.6892	262.9608	230.5819	223.1430	200.6453	197.6235	205.6462	208.1151	232.5945	247.9988	276.9190	(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

280.0762	247.6892	262.9608	230.5819	223.1430	200.6453	197.6235	205.6462	208.1151	232.5945	247.9988	276.9190	(64)

Total per year (kWh/year) = Sum(64)m = 2813.9936 (64)
12Total per year (kWh/year) 2814 (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

118.0872	104.9029	112.3963	100.8251	99.1569	90.8712	90.6717	93.3392	93.3549	102.2996	106.6163	117.0375	(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	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.4525	163.2510	147.4525	152.3676	147.4525	152.3676	147.4525	147.4525	152.3676	147.4525	152.3676	147.4525	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	256.3278	258.9876	252.2848	238.0153	220.0027	203.0733	191.7634	189.1036	195.8064	210.0759	228.0885	245.0179	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	(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)	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	(71)

Water heating gains (Table 5)

	158.7194	156.1055	151.0703	140.0349	133.2754	126.2100	121.8706	125.4560	129.6596	137.4994	148.0782	157.3084 (72)

Total internal gains

	626.5925	642.4370	614.9006	594.5108	564.8235	545.7438	525.1794	526.1049	541.9265	559.1207	592.6272	613.8717 (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
East	4.7000	19.6403	0.7600	0.7000	0.7700	34.0322 (76)
South	5.9000	46.7521	0.7600	0.7000	0.7700	101.6945 (78)

Solar gains	135.7268	233.1237	321.7927	399.6814	445.8307	441.0668	425.9299	392.2175	349.1342	258.6351	162.9769	115.8599 (83)
Total gains	762.3193	875.5607	936.6933	994.1922	1010.6542	986.8106	951.1093	918.3224	891.0607	817.7558	755.6041	729.7316 (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	71.5658	71.6507	71.7341	72.1285	72.2027	72.5505	72.5505	72.6153	72.4161	72.2027	72.0526	71.8964	
alpha	5.7711	5.7767	5.7823	5.8086	5.8135	5.8367	5.8367	5.8410	5.8277	5.8135	5.8035	5.7931	
util living area													
	0.9896	0.9765	0.9511	0.8821	0.7520	0.5602	0.4050	0.4375	0.6563	0.8976	0.9762	0.9917	(86)
Living	20.1154	20.3033	20.5203	20.7680	20.9266	20.9888	20.9986	20.9977	20.9730	20.7778	20.4056	20.0751	
Non living	19.1510	19.3879	19.6571	19.9530	20.1221	20.1796	20.1856	20.1859	20.1671	19.9706	19.5221	19.1027	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5475	20.3033	20.5203	20.7680	20.9266	20.9888	20.9986	20.9977	20.9730	20.7778	20.4056	20.2045	(87)
Th 2	20.1758	20.1767	20.1776	20.1817	20.1825	20.1861	20.1861	20.1868	20.1847	20.1825	20.1809	20.1793	(88)
util rest of house													
	0.9867	0.9704	0.9385	0.8541	0.7021	0.4928	0.3308	0.3612	0.5881	0.8671	0.9690	0.9895	(89)
MIT 2	19.7673	19.3879	19.6571	19.9530	20.1221	20.1796	20.1856	20.1859	20.1671	19.9706	19.5221	19.2967	(90)
Living area fraction										fLA = Living area / (4) =		0.2500	(91)
MIT	19.9623	19.6168	19.8729	20.1567	20.3232	20.3819	20.3888	20.3889	20.3686	20.1724	19.7430	19.5237	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9623	19.6168	19.8729	20.1567	20.3232	20.3819	20.3888	20.3889	20.3686	20.1724	19.7430	19.5237	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9859	0.9652	0.9331	0.8532	0.7111	0.5093	0.3493	0.3803	0.6040	0.8667	0.9641	0.9871	(94)
Useful gains	751.5421	845.1275	874.0083	848.2209	718.6968	502.5896	332.2495	349.1997	538.1700	708.7311	728.5018	720.3479	(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													
	1394.3298	1308.6010	1187.7216	994.3085	760.9060	507.7423	332.7205	349.9744	551.5062	844.6617	1117.9340	1357.9084	(97)
Space heating kWh													
	478.2340	311.4541	233.4027	105.1830	31.4036	0.0000	0.0000	0.0000	0.0000	101.1324	280.3912	474.3450	(98a)
Space heating requirement - total per year (kWh/year)												2015.5461	
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													
	478.2340	311.4541	233.4027	105.1830	31.4036	0.0000	0.0000	0.0000	0.0000	101.1324	280.3912	474.3450	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2015.5461	
Space heating per m2											(98c) / (4) =	20.1555	(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 %)	253.3850 (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													
	478.2340	311.4541	233.4027	105.1830	31.4036	0.0000	0.0000	0.0000	0.0000	101.1324	280.3912	474.3450	(98)
Space heating efficiency (main heating system 1)													
	253.3850	253.3850	253.3850	253.3850	253.3850	0.0000	0.0000	0.0000	0.0000	253.3850	253.3850	253.3850	(210)
Space heating fuel (main heating system)													
	188.7381	122.9174	92.1139	41.5112	12.3936	0.0000	0.0000	0.0000	0.0000	39.9125	110.6582	187.2033	(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												
	280.0762	247.6892	262.9608	230.5819	223.1430	200.6453	197.6235	205.6462	208.1151	232.5945	247.9988	276.9190 (64)
Efficiency of water heater												167.9964 (216)
(217)m	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964 (217)
Fuel for water heating, kWh/month												
	166.7156	147.4372	156.5276	137.2541	132.8261	119.4343	117.6356	122.4111	123.8807	138.4521	147.6215	164.8363 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	39.4133	31.6188	28.4692	20.8578	16.1111	13.1629	14.6971	19.1039	24.8141	32.5574	36.7735	40.5087 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	795.4481 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	167.9964
Water heating fuel used	1675.0323 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	318.0878 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	2788.5682 (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	795.4481	0.1568	124.7482	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1675.0323	0.1409	236.0755	(264)
Space and water heating			360.8237	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	318.0878	0.1443	45.9099	(268)
Total CO2, kg/year			406.7336	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0700	(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	795.4481	1.5806	1257.2497	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1675.0323	1.5211	2547.9571	(278)
Space and water heating			3805.2068	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	318.0878	1.5338	487.8938	(282)
Total Primary energy kWh/year			4293.1006	(286)
Dwelling Primary energy Rate (DPER)			42.9300	(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	50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
First floor	50.0000 (1c)	x	2.4000 (2c)	=	120.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.0000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80	=	0.0000 (6a)
Number of open flues	0 * 20	=	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10	=	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20	=	0.0000 (6d)
Number of flues attached to other heater	0 * 35	=	0.0000 (6e)
Number of blocked chimneys	0 * 20	=	0.0000 (6f)
Number of intermittent extract fans	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)	=	0.1250 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3750 (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)	=	0.3187 (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	0.4064	0.3984	0.3905	0.3506	0.3427	0.3028	0.3028	0.2948	0.3187	0.3427	0.3586	0.3745	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5458	0.5458	0.5435	0.5508	0.5587	0.5643	0.5701	(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 Opening Type (Uw = 1.20)			10.6000	1.1450	12.1374			(27)
Heatloss Floor 1			50.0000	0.1300	6.5000			(28a)
External Wall 1	100.0000	10.6000	89.4000	0.1800	16.0920			(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000			(30)
Total net area of external elements Aum(A, m2)			200.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.2294			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 229.3600 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	21.0000	0.1600	3.3600
E6 Intermediate floor within a dwelling	21.0000	0.0000	0.0000
E16 Corner (normal)	9.6000	0.0900	0.8640
E18 Party wall between dwellings	9.6000	0.0600	0.5760
E2 Other lintels (including other steel lintels)	14.0500	0.0500	0.7025
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	32.9000	0.0500	1.6450
E10 Eaves (insulation at ceiling level)	11.0000	0.0600	0.6600
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9475 (36)
Point Thermal bridges	(36a)	=	0.0000
Total fabric heat loss	(33) + (36) + (36a)	=	49.1769 (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	46.1406	45.8866	45.6376	44.4683	44.2496	43.2311	43.2311	43.0425	43.6234	44.2496	44.6921	45.1548	(38)
Heat transfer coeff	95.3175	95.0635	94.8146	93.6452	93.4265	92.4080	92.4080	92.2194	92.8003	93.4265	93.8690	94.3317	(39)
Average = Sum(39)m / 12 =												93.6442	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9532	0.9506	0.9481	0.9365	0.9343	0.9241	0.9241	0.9222	0.9280	0.9343	0.9387	0.9433	(40)
HLP (average)												0.9364	
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												2.7395	(42)
Hot water usage for mixer showers													
	70.1526	69.0984	67.5621	64.6228	62.4536	60.0345	58.6596	60.1842	61.8555	64.4528	67.4553	69.8838	(42a)
Hot water usage for baths													
	30.2911	29.8413	29.2078	28.0397	27.1651	26.1952	25.6714	26.3005	26.9854	28.0232	29.2153	30.1887	(42b)
Hot water usage for other uses													
	42.6855	41.1333	39.5811	38.0289	36.4767	34.9245	34.9245	36.4767	38.0289	39.5811	41.1333	42.6855	(42c)
Average daily hot water use (litres/day)												131.5680	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	143.1293	140.0729	136.3510	130.6913	126.0953	121.1543	119.2554	122.9613	126.8698	132.0570	137.8038	142.7581	(44)
Energy conte	226.6818	199.4620	209.5664	178.9099	169.7486	148.9733	144.2291	152.2518	156.4431	179.2001	196.3268	223.5246	(45)
Energy content (annual)										Total = Sum(45)m =		2185.3176	
Distribution loss (46)m = 0.15 x (45)m													
	34.0023	29.9193	31.4350	26.8365	25.4623	22.3460	21.6344	22.8378	23.4665	26.8800	29.4490	33.5287	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	273.2767	241.5477	256.1613	224.0018	216.3435	194.0651	190.8240	198.8467	201.5349	225.7950	241.4187	270.1195	(62)
WWHRS	-32.0709	-28.3637	-29.7009	-24.5935	-22.9202	-19.6130	-18.3841	-19.5496	-20.2924	-23.9225	-27.1013	-31.4769	(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													
	241.2058	213.1840	226.4604	199.4083	193.4232	174.4521	172.4399	179.2971	181.2426	201.8726	214.3174	238.6426	(64)
										Total per year (kWh/year) = Sum(64)m =		2435.9460	(64)
12Total per year (kWh/year)												2436	(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													
	112.6476	99.9897	106.9567	95.5610	93.7173	85.6071	85.2321	87.8997	88.0908	96.8600	101.3521	111.5979	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	147.4525	163.2510	147.4525	152.3676	147.4525	152.3676	147.4525	147.4525	152.3676	147.4525	152.3676	147.4525	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	256.3278	258.9876	252.2848	238.0153	220.0027	203.0733	191.7634	189.1036	195.8064	210.0759	228.0885	245.0179	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	(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)													
	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	(71)
Water heating gains (Table 5)													
	151.4081	148.7942	143.7591	132.7236	125.9641	118.8987	114.5593	118.1447	122.3483	130.1881	140.7669	149.9971	(72)
Total internal gains													
	622.2812	638.1257	610.5893	590.1995	560.5122	538.4325	517.8681	518.7936	534.6152	554.8094	588.3159	609.5604	(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	
East	4.7000	19.6403	0.6300	0.7000	0.7700	28.2109	(76)
South	5.9000	46.7521	0.6300	0.7000	0.7700	84.2994	(78)

Solar gains	112.5103	193.2473	266.7492	331.3149	369.5702	365.6211	353.0735	325.1277	289.4139	214.3949	135.0993	96.0417	(83)
Total gains	734.7916	831.3730	877.3385	921.5143	930.0824	904.0536	870.9416	843.9213	824.0291	769.2043	723.4151	705.6022	(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	66.8410	67.0195	67.1955	68.0345	68.1939	68.9454	68.9454	69.0864	68.6540	68.1939	67.8723	67.5394	

alpha	5.4561	5.4680	5.4797	5.5356	5.5463	5.5964	5.5964	5.6058	5.5769	5.5463	5.5248	5.5026	
util living area													
	0.9920	0.9834	0.9674	0.9197	0.8170	0.6318	0.4633	0.4973	0.7247	0.9272	0.9825	0.9935	(86)
MIT	19.9710	20.1494	20.3719	20.6583	20.8695	20.9757	20.9963	20.9946	20.9482	20.6906	20.2895	19.9440	(87)
Th 2	20.1225	20.1247	20.1268	20.1366	20.1385	20.1471	20.1471	20.1487	20.1438	20.1385	20.1347	20.1308	(88)
util rest of house													
	0.9898	0.9789	0.9581	0.8972	0.7695	0.5565	0.3754	0.4080	0.6530	0.9022	0.9768	0.9917	(89)
MIT 2	18.9276	19.1548	19.4352	19.7904	20.0269	20.1325	20.1458	20.1466	20.1087	19.8355	19.3414	18.8995	(90)
Living area fraction										fLA = Living area / (4) =		0.2500	(91)
MIT	19.1884	19.4034	19.6694	20.0074	20.2375	20.3433	20.3584	20.3586	20.3186	20.0493	19.5784	19.1606	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1884	19.4034	19.6694	20.0074	20.2375	20.3433	20.3584	20.3586	20.3186	20.0493	19.5784	19.1606	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9865	0.9740	0.9521	0.8933	0.7755	0.5744	0.3974	0.4303	0.6685	0.8991	0.9721	0.9889	(94)
Useful gains	724.8832	809.7884	835.3537	823.1975	721.2368	519.2607	346.0859	363.1608	550.8469	691.6043	703.2444	697.7351	(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													
	1419.1252	1378.7447	1248.6524	1040.1533	797.6323	530.7243	347.3057	365.0567	577.0893	882.8160	1171.3387	1411.2585	(97)
Space heating kWh													
	516.5161	382.3386	307.4942	156.2081	56.8382	0.0000	0.0000	0.0000	0.0000	142.2615	337.0279	530.8614	(98a)
Space heating requirement - total per year (kWh/year)												2429.5462	
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													
	516.5161	382.3386	307.4942	156.2081	56.8382	0.0000	0.0000	0.0000	0.0000	142.2615	337.0279	530.8614	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2429.5462	
Space heating per m2											(98c) / (4) =	24.2955	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	516.5161	382.3386	307.4942	156.2081	56.8382	0.0000	0.0000	0.0000	0.0000	142.2615	337.0279	530.8614	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	559.6057	414.2347	333.1465	169.2396	61.5799	0.0000	0.0000	0.0000	0.0000	154.1295	365.1440	575.1478	(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													
	241.2058	213.1840	226.4604	199.4083	193.4232	174.4521	172.4399	179.2971	181.2426	201.8726	214.3174	238.6426	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7224	85.3540	84.7463	83.5182	81.6802	79.8000	79.8000	79.8000	79.8000	83.2896	85.0705	85.7990	(217)
Fuel for water heating, kWh/month													
	281.3801	249.7646	267.2215	238.7603	236.8057	218.6117	216.0901	224.6831	227.1210	242.3742	251.9292	278.1413	(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	30.6377	24.5787	22.1304	16.2137	12.5239	10.2321	11.4247	14.8503	19.2891	25.3083	28.5857	31.4892	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.8440	-64.1351	-91.4528	-101.9369	-109.1268	-101.5301	-100.2579	-95.0489	-85.7174	-72.9317	-50.2198	-39.6919	(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	-27.3659	-57.4172	-113.8667	-170.6646	-225.3404	-226.3366	-223.6865	-189.5402	-139.1118	-82.0022	-36.4980	-21.6521	(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												2632.2277	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2932.8828	(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)	247.2639 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2471.3753 (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	3426.9992 (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	2632.2277	0.2100	552.7678	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2932.8828	0.2100	615.9054	(264)
Space and water heating			1168.6732	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	247.2639	0.1443	35.6878	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-957.8931	0.1348	-129.0951	
PV Unit electricity exported	-1513.4822	0.1260	-190.6306	
Total			-319.7256	(269)
Total CO2, kg/year			896.5647	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.9700	(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	2632.2277	1.1300	2974.4173	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2932.8828	1.1300	3314.1576	(278)
Space and water heating			6288.5749	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	247.2639	1.5338	379.2617	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-957.8931	1.4981	-1435.0167	
PV Unit electricity exported	-1513.4822	0.4623	-699.7488	
Total			-2134.7655	(283)
Total Primary energy kWh/year			4663.1719	(286)
Target Primary Energy Rate (TPER)			46.6300	(287)

Full SAP Calculation Printout

Property Reference	House Type A	Issued on Date	05/10/2023
Assessment Reference	Plot 30	Prop Type Ref	
Property			

SAP Rating	81 B	DER	5.26	TER	14.44
Environmental	96 A	% DER < TER			63.57
CO_2 Emissions (t/year)	0.27	DFEE	32.40	TFEE	38.15
Compliance Check	See BREL	% DFEE < TFEE			15.06
% DPER < TPER	27.08	DPER	55.64	TPER	76.30

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	56.0000 (1b)	x	2.4000 (2b)	=	134.4000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	56.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	134.4000	(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	1 * 10 =	10.0000 (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) =	10.0000 / (5) =	0.0744 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2744 (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) =	0.2332 (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	0.2974	0.2916	0.2857	0.2566	0.2507	0.2216	0.2216	0.2158	0.2332	0.2507	0.2624	0.2741	(22b)
Effective ac	0.5442	0.5425	0.5408	0.5329	0.5314	0.5245	0.5245	0.5233	0.5272	0.5314	0.5344	0.5376	(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	
Opening Type 1 (Uw = 1.20)			14.1000	1.1450	16.1450			(27)
Opening Type 2			3.0000	1.2000	3.6000			(26)
Heatloss Floor 1			56.0000	0.1200	6.7200	110.0000	6160.0000	(28a)
External Wall 1	65.0000	17.1000	47.9000	0.1900	9.1010	190.0000	9101.0000	(29a)
Total net area of external elements Aum(A, m2)			121.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.5660			(33)
Party Ceiling 1			56.0000			30.0000	1680.0000	(32b)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 16941.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 302.5179 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	24.0000	0.0670	1.6080
E16 Corner (normal)	9.6000	0.0410	0.3936
E2 Other lintels (including other steel lintels)	8.5000	0.0240	0.2040
E3 Sill	5.2000	0.0190	0.0988
E4 Jamb	24.0800	0.0140	0.3371
E7 Party floor between dwellings (in blocks of flats)	24.0000	0.0510	1.2240
E18 Party wall between dwellings	4.8000	0.0400	0.1920

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.0575 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.6236 (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	24.1372	24.0611	23.9864	23.6358	23.5702	23.2648	23.2648	23.2083	23.3824	23.5702	23.7029	23.8416	(38)
Heat transfer coeff	63.7608	63.6846	63.6100	63.2593	63.1937	62.8884	62.8884	62.8318	63.0060	63.1937	63.3265	63.4652	(39)

Average = Sum(39)m / 12 = 63.2590

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1386	1.1372	1.1359	1.1296	1.1285	1.1230	1.1230	1.1220	1.1251	1.1285	1.1308	1.1333	(40)
HLP (average)												1.1296	
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 1.8666 (42)
Hot water usage for mixer showers

55.5162	54.6819	53.4661	51.1400	49.4234	47.5091	46.4210	47.6275	48.9501	51.0055	53.3816	55.3035	(42a)

Hot water usage for baths

23.9970	23.6406	23.1387	22.2134	21.5205	20.7522	20.3372	20.8355	21.3781	22.2003	23.1447	23.9159	(42b)

Hot water usage for other uses

33.7458	32.5187	31.2915	30.0644	28.8373	27.6102	27.6102	28.8373	30.0644	31.2915	32.5187	33.7458	(42c)

Average daily hot water use (litres/day) 104.1111 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.2590	110.8412	107.8964	103.4179	99.7812	95.8715	94.3684	97.3004	100.3927	104.4974	109.0450	112.9651	(44)
Energy conte	179.3745	157.8363	165.8328	141.5739	134.3247	117.8852	114.1303	120.4782	123.7942	141.8019	155.3545	176.8761	(45)

Energy content (annual) Total = Sum(45)m = 1729.2628

Distribution loss (46)m = 0.15 x (45)m	26.9062	23.6755	24.8749	21.2361	20.1487	17.6828	17.1196	18.0717	18.5691	21.2703	23.3032	26.5314	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

232.7689	206.0635	219.2272	193.2459	187.7191	169.5572	167.5247	173.8726	175.4662	195.1963	207.0265	230.2705	(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

232.7689	206.0635	219.2272	193.2459	187.7191	169.5572	167.5247	173.8726	175.4662	195.1963	207.0265	230.2705	(64)

Total per year (kWh/year) = Sum(64)m = 2357.9388 (64)
12Total per year (kWh/year) 2358 (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

102.3576	91.0623	97.8549	88.4109	87.3785	80.5344	80.6639	82.7745	82.4992	89.8647	92.9930	101.5268	(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	93.3297	93.3297	93.3297	93.3297	93.3297	93.3297	93.3297	93.3297	93.3297	93.3297	93.3297	93.3297	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	82.0931	90.8888	82.0931	84.8295	82.0931	84.8295	82.0931	82.0931	84.8295	82.0931	84.8295	82.0931	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	162.7587	164.4476	160.1916	151.1310	139.6936	128.9441	121.7627	120.0738	124.3298	133.3904	144.8278	155.5774	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.3330	32.3330	32.3330	32.3330	32.3330	32.3330	32.3330	32.3330	32.3330	32.3330	32.3330	32.3330	(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)	-74.6638	-74.6638	-74.6638	-74.6638	-74.6638	-74.6638	-74.6638	-74.6638	-74.6638	-74.6638	-74.6638	-74.6638	(71)
Water heating gains (Table 5)	137.5774	135.5094	131.5254	122.7929	117.4442	111.8534	108.4192	111.2561	114.5822	120.7858	129.1569	136.4608	(72)

Total internal gains

	433.4280	441.8447	424.8090	409.7523	390.2298	376.6258	363.2739	364.4219	374.7405	387.2683	409.8132	425.1301 (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	4.6500	10.6334	0.7600	0.7000	0.7700	18.2293 (74)
South	5.6500	46.7521	0.7600	0.7000	0.7700	97.3855 (78)
West	3.8000	19.6403	0.7600	0.7000	0.7700	27.5154 (80)

Solar gains	143.1301	248.1553	351.0053	453.9871	525.8064	529.5865	507.4245	452.7038	386.4996	277.3654	172.2316	121.9742 (83)
Total gains	576.5582	690.0001	775.8143	863.7394	916.0362	906.2123	870.6984	817.1257	761.2401	664.6337	582.0448	547.1043 (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	73.8045	73.8928	73.9795	74.3895	74.4668	74.8284	74.8284	74.8957	74.6887	74.4668	74.3107	74.1483	
alpha	5.9203	5.9262	5.9320	5.9593	5.9645	5.9886	5.9886	5.9930	5.9792	5.9645	5.9540	5.9432	
util living area	0.9877	0.9666	0.9185	0.7999	0.6245	0.4422	0.3176	0.3533	0.5623	0.8516	0.9694	0.9907	(86)
Living	20.1854	20.4105	20.6549	20.8772	20.9742	20.9971	20.9997	20.9994	20.9890	20.8497	20.4797	20.1372	
Non living	19.0575	19.3367	19.6278	19.8719	19.9605	19.9809	19.9820	19.9828	19.9749	19.8532	19.4304	19.0003	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5833	20.4105	20.6549	20.8772	20.9742	20.9971	20.9997	20.9994	20.9890	20.8497	20.4797	20.2579	(87)
Th 2	19.9694	19.9705	19.9716	19.9767	19.9777	19.9821	19.9821	19.9829	19.9804	19.9777	19.9757	19.9737	(88)
util rest of house	0.9833	0.9557	0.8946	0.7538	0.5622	0.3729	0.2442	0.2754	0.4833	0.8030	0.9575	0.9873	(89)
MIT 2	19.6059	19.3367	19.6278	19.8719	19.9605	19.9809	19.9820	19.9828	19.9749	19.8532	19.4304	19.1757	(90)
Living area fraction										fLA = Living area / (4) =		0.4464	(91)
MIT	20.0422	19.8161	20.0863	20.3207	20.4131	20.4346	20.4363	20.4366	20.4276	20.2981	19.8989	19.6588	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0422	19.8161	20.0863	20.3207	20.4131	20.4346	20.4363	20.4366	20.4276	20.2981	19.8989	19.6588	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9837	0.9538	0.8976	0.7701	0.5892	0.4038	0.2770	0.3102	0.5184	0.8195	0.9564	0.9860	(94)
Useful gains	567.1429	658.1247	696.3786	665.1725	539.7505	365.9514	241.1803	253.4699	394.6635	544.6561	556.6597	539.4485	(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	1003.7357	949.9238	864.2268	722.4664	550.6126	366.9254	241.2604	253.6277	398.6787	612.8569	810.5067	981.0961	(97)
Space heating kWh	324.8250	196.0890	124.8791	41.2515	8.0813	0.0000	0.0000	0.0000	0.0000	50.7414	182.7698	328.5858	(98a)
Space heating requirement - total per year (kWh/year)												1257.2229	
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	324.8250	196.0890	124.8791	41.2515	8.0813	0.0000	0.0000	0.0000	0.0000	50.7414	182.7698	328.5858	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1257.2229	
Space heating per m2											(98c) / (4) =	22.4504	(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 %)	253.5393 (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	324.8250	196.0890	124.8791	41.2515	8.0813	0.0000	0.0000	0.0000	0.0000	50.7414	182.7698	328.5858	(98)
Space heating efficiency (main heating system 1)	253.5393	253.5393	253.5393	253.5393	253.5393	0.0000	0.0000	0.0000	0.0000	253.5393	253.5393	253.5393	(210)
Space heating fuel (main heating system)	128.1163	77.3407	49.2543	16.2703	3.1874	0.0000	0.0000	0.0000	0.0000	20.0132	72.0874	129.5996	(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

	232.7689	206.0635	219.2272	193.2459	187.7191	169.5572	167.5247	173.8726	175.4662	195.1963	207.0265	230.2705 (64)
Efficiency of water heater												173.0767 (216)
(217)m	173.0767	173.0767	173.0767	173.0767	173.0767	173.0767	173.0767	173.0767	173.0767	173.0767	173.0767	173.0767 (217)
Fuel for water heating, kWh/month												
	134.4889	119.0591	126.6648	111.6533	108.4601	97.9665	96.7922	100.4598	101.3806	112.7803	119.6155	133.0454 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	20.8830	16.7531	15.0843	11.0514	8.5364	6.9743	7.7872	10.1221	13.1477	17.2504	19.4843	21.4634 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	495.8691 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	173.0767
Water heating fuel used	1362.3665 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	168.5379 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	2026.7735 (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	495.8691	0.1578	78.2725	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1362.3665	0.1408	191.8403	(264)
Space and water heating			270.1128	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	168.5379	0.1443	24.3252	(268)
Total CO2, kg/year			294.4380	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.2600	(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	495.8691	1.5843	785.5997	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1362.3665	1.5207	2071.7167	(278)
Space and water heating			2857.3164	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	168.5379	1.5338	258.5091	(282)
Total Primary energy kWh/year			3115.8254	(286)
Dwelling Primary energy Rate (DPER)			55.6400	(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	56.0000 (1b)	x	2.4000 (2b)	=	134.4000 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 56.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	134.4000	(5)

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2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1488 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3988 (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) =		0.3390 (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	0.4322	0.4237	0.4153	0.3729	0.3644	0.3220	0.3220	0.3136	0.3390	0.3644	0.3814	0.3983	(22b)
Effective ac	0.5934	0.5898	0.5862	0.5695	0.5664	0.5519	0.5519	0.5492	0.5575	0.5664	0.5727	0.5793	(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			3.0000	1.0000	3.0000			(26)
TER Opening Type (Uw = 1.20)			11.0000	1.1450	12.5954			(27)
Heatloss Floor 1			56.0000	0.1300	7.2800			(28a)
External Wall 1	65.0000	14.0000	51.0000	0.1800	9.1800			(29a)
Total net area of external elements Aum(A, m2)			121.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.0554			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 312.5179 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	24.0000	0.1600	3.8400
E16 Corner (normal)	9.6000	0.0900	0.8640
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3 Sill	5.2000	0.0500	0.2600
E4 Jamb	24.0800	0.0500	1.2040
E7 Party floor between dwellings (in blocks of flats)	24.0000	0.0700	1.6800
E18 Party wall between dwellings	4.8000	0.0600	0.2880

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.5610 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	40.6164 (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	26.3186	26.1577	26.0001	25.2595	25.1209	24.4758	24.4758	24.3564	24.7243	25.1209	25.4012	25.6943	(38)
Heat transfer coeff	66.9350	66.7742	66.6165	65.8759	65.7373	65.0923	65.0923	64.9728	65.3407	65.7373	66.0176	66.3107	(39)
Average = Sum(39)m / 12 =												65.8752	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1953	1.1924	1.1896	1.1764	1.1739	1.1624	1.1624	1.1602	1.1668	1.1739	1.1789	1.1841	(40)
HLP (average)												1.1763	
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 1.8666 (42)

Hot water usage for mixer showers

55.5162	54.6819	53.4661	51.1400	49.4234	47.5091	46.4210	47.6275	48.9501	51.0055	53.3816	55.3035 (42a)

Hot water usage for baths

23.9970	23.6406	23.1387	22.2134	21.5205	20.7522	20.3372	20.8355	21.3781	22.2003	23.1447	23.9159 (42b)

Hot water usage for other uses

33.7458	32.5187	31.2915	30.0644	28.8373	27.6102	27.6102	28.8373	30.0644	31.2915	32.5187	33.7458 (42c)

Average daily hot water use (litres/day) 104.1111 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	113.2590	110.8412	107.8964	103.4179	99.7812	95.8715	94.3684	97.3004	100.3927	104.4974	109.0450	112.9651	(44)
Energy conte	179.3745	157.8363	165.8328	141.5739	134.3247	117.8852	114.1303	120.4782	123.7942	141.8019	155.3545	176.8761	(45)
Energy content (annual)										Total = Sum(45)m =		1729.2628	
Distribution loss (46)m = 0.15 x (45)m													
	26.9062	23.6755	24.8749	21.2361	20.1487	17.6828	17.1196	18.0717	18.5691	21.2703	23.3032	26.5314	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	225.9694	199.9221	212.4277	186.6657	180.9196	162.9770	160.7252	167.0731	168.8861	188.3968	200.4464	223.4710	(62)
WWHRS	-25.3797	-22.4460	-23.5042	-19.4624	-18.1382	-15.5210	-14.5485	-15.4708	-16.0586	-18.9314	-21.4469	-24.9097	(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													
	200.5897	177.4761	188.9235	167.2034	162.7814	147.4560	146.1768	151.6022	152.8274	169.4655	178.9994	198.5613	(64)
										Total per year (kWh/year) = Sum(64)m =		2042.0628	(64)
12Total per year (kWh/year)												2042	(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													
	96.9180	86.1492	92.4153	83.1468	81.9389	75.2703	75.2243	77.3349	77.2351	84.4251	87.7289	96.0872	(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	93.3297	93.3297	93.3297	93.3297	93.3297	93.3297	93.3297	93.3297	93.3297	93.3297	93.3297	93.3297	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	82.8353	91.7105	82.8353	85.5965	82.8353	85.5965	82.8353	82.8353	85.5965	82.8353	85.5965	82.8353	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	162.7587	164.4476	160.1916	151.1310	139.6936	128.9441	121.7627	120.0738	124.3298	133.3904	144.8278	155.5774	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.3330	32.3330	32.3330	32.3330	32.3330	32.3330	32.3330	32.3330	32.3330	32.3330	32.3330	32.3330	(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)													
	-74.6638	-74.6638	-74.6638	-74.6638	-74.6638	-74.6638	-74.6638	-74.6638	-74.6638	-74.6638	-74.6638	-74.6638	(71)
Water heating gains (Table 5)													
	130.2661	128.1982	124.2142	115.4816	110.1329	104.5421	101.1079	103.9448	107.2709	113.4745	121.8456	129.1495	(72)
Total internal gains													
	429.8590	438.3552	421.2400	406.2080	386.6607	370.0815	356.7048	357.8528	368.1962	383.6992	406.2689	421.5611	(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	3.6300	10.6334	0.6300	0.7000	0.7700	11.7964	(74)
South	4.4100	46.7521	0.6300	0.7000	0.7700	63.0103	(78)
West	2.9600	19.6403	0.6300	0.7000	0.7700	17.7669	(80)

Solar gains	92.5735	160.4939	226.9964	293.5776	340.0109	342.4526	328.1228	292.7435	249.9440	179.3808	111.3942	78.8913	(83)
Total gains	522.4325	598.8491	648.2363	699.7856	726.6717	712.5342	684.8276	650.5963	618.1402	563.0800	517.6631	500.4524	(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	72.6285	72.8035	72.9758	73.7962	73.9517	74.6846	74.6846	74.8219	74.4006	73.9517	73.6377	73.3123	
alpha	5.8419	5.8536	5.8651	5.9197	5.9301	5.9790	5.9790	5.9881	5.9600	5.9301	5.9092	5.8875	
util living area													
	0.9937	0.9853	0.9661	0.9049	0.7727	0.5746	0.4169	0.4570	0.6955	0.9245	0.9849	0.9950	(86)

MIT	20.0497	20.2298	20.4604	20.7391	20.9206	20.9886	20.9985	20.9975	20.9666	20.7403	20.3511	20.0205	(87)
Th 2	19.9238	19.9261	19.9283	19.9390	19.9410	19.9502	19.9502	19.9519	19.9467	19.9410	19.9369	19.9327	(88)
util rest of house													
	0.9912	0.9798	0.9532	0.8714	0.7073	0.4853	0.3182	0.3543	0.6041	0.8900	0.9781	0.9931	(89)
MIT 2	18.8485	19.0771	19.3644	19.6991	19.8842	19.9452	19.9499	19.9513	19.9291	19.7103	19.2404	18.8182	(90)
Living area fraction										fLA = Living area / (4) =		0.4464	(91)
MIT	19.3847	19.5917	19.8537	20.1634	20.3468	20.4110	20.4180	20.4184	20.3923	20.1701	19.7362	19.3549	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3847	19.5917	19.8537	20.1634	20.3468	20.4110	20.4180	20.4184	20.3923	20.1701	19.7362	19.3549	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9896	0.9776	0.9522	0.8793	0.7337	0.5251	0.3624	0.4003	0.6443	0.8986	0.9765	0.9916	(94)
Useful gains	517.0039	585.4179	617.2240	615.3169	533.1406	374.1756	248.1557	260.4251	398.2719	505.9812	505.5006	496.2734	(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													
	1009.6977	981.0258	889.5743	741.9873	568.4202	378.2490	248.5254	261.0862	411.1417	629.1120	834.2145	1004.9328	(97)
Space heating kWh													
	366.5642	265.8485	202.6286	91.2027	26.2480	0.0000	0.0000	0.0000	0.0000	91.6093	236.6741	378.4426	(98a)
Space heating requirement - total per year (kWh/year)												1659.2180	
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													
	366.5642	265.8485	202.6286	91.2027	26.2480	0.0000	0.0000	0.0000	0.0000	91.6093	236.6741	378.4426	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1659.2180	
Space heating per m2											(98c) / (4) =	29.6289	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	366.5642	265.8485	202.6286	91.2027	26.2480	0.0000	0.0000	0.0000	0.0000	91.6093	236.6741	378.4426	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	397.1443	288.0265	219.5326	98.8111	28.4378	0.0000	0.0000	0.0000	0.0000	99.2517	256.4183	410.0137	(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													
	200.5897	177.4761	188.9235	167.2034	162.7814	147.4560	146.1768	151.6022	152.8274	169.4655	178.9994	198.5613	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3938	84.9639	84.2171	82.7604	80.9391	79.8000	79.8000	79.8000	79.8000	82.7426	84.6870	85.4823	(217)
Fuel for water heating, kWh/month													
	234.8997	208.8841	224.3291	202.0329	201.1159	184.7819	183.1789	189.9777	191.5131	204.8104	211.3658	232.2835	(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	17.2115	13.8077	12.4323	9.1085	7.0356	5.7482	6.4181	8.3425	10.8361	14.2176	16.0588	17.6899	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.2086	-28.0396	-41.7254	-48.6400	-53.9707	-50.9569	-50.3568	-46.7982	-40.7582	-32.8486	-21.4640	-16.4986	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.1230	-17.3399	-34.9273	-53.1312	-70.8970	-71.4467	-70.5825	-59.4484	-43.1780	-24.9934	-10.9106	-6.4031	(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												1797.6360	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2469.1732	(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)	138.9070 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-922.6468 (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	3569.0694 (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	1797.6360	0.2100	377.5036	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2469.1732	0.2100	518.5264	(264)
Space and water heating			896.0299	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	138.9070	0.1443	20.0486	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-451.2657	0.1338	-60.3971	
PV Unit electricity exported	-471.3811	0.1255	-59.1734	
Total			-119.5704	(269)
Total CO2, kg/year			808.4373	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.4400	(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	1797.6360	1.1300	2031.3287	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2469.1732	1.1300	2790.1657	(278)
Space and water heating			4821.4944	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	138.9070	1.5338	213.0602	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-451.2657	1.4946	-674.4639	
PV Unit electricity exported	-471.3811	0.4608	-217.1992	
Total			-891.6631	(283)
Total Primary energy kWh/year			4272.9923	(286)
Target Primary Energy Rate (TPER)			76.3000	(287)

Full SAP Calculation Printout

Property Reference	House Type A	Issued on Date	05/10/2023
Assessment Reference	Plot 31	Prop Type Ref	
Property			

SAP Rating	82 B	DER	5.29	TER	14.89
Environmental	96 A	% DER < TER			64.47
CO_2 Emissions (t/year)	0.25	DFEE	30.78	TFEE	38.14
Compliance Check	See BREL	% DFEE < TFEE			19.28
% DPER < TPER	28.78	DPER	56.13	TPER	78.82

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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		51.0000 (1b)	x	2.4000 (2b)	=	122.4000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	122.4000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0817	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2817	(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) =	0.2394	(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	0.3053	0.2993	0.2933	0.2634	0.2574	0.2275	0.2275	0.2215	0.2394	0.2574	0.2694	0.2813	(22b)
Effective ac	0.5466	0.5448	0.5430	0.5347	0.5331	0.5259	0.5259	0.5245	0.5287	0.5331	0.5363	0.5396	(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	
Opening Type 1 (Uw = 1.20)			11.3400	1.1450	12.9847			(27)
Heatloss Floor 1			51.0000	0.1200	6.1200	110.0000	5610.0000	(28a)
External Wall 1	65.0000	11.3400	53.6600	0.1900	10.1954	190.0000	10195.4000	(29a)
Total net area of external elements Aum(A, m2)			116.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.3001			(33)
Party Ceiling 1			51.0000			30.0000	1530.0000	(32b)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17335.4000	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 339.9098 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	24.0000	0.0670	1.6080
E16 Corner (normal)	9.6000	0.0410	0.3936
E2 Other lintels (including other steel lintels)	8.5000	0.0240	0.2040
E3 Sill	5.2000	0.0190	0.0988
E4 Jamb	24.0800	0.0140	0.3371
E7 Party floor between dwellings (in blocks of flats)	24.0000	0.0510	1.2240
E18 Party wall between dwellings	4.8000	0.0400	0.1920

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.0575 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 33.3577 (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	22.0783	22.0052	21.9336	21.5971	21.5341	21.2410	21.2410	21.1867	21.3539	21.5341	21.6615	21.7946	(38)
Heat transfer coeff	55.4360	55.3629	55.2912	54.9547	54.8918	54.5987	54.5987	54.5444	54.7116	54.8918	55.0191	55.1523	(39)

Average = Sum(39)m / 12 = 54.9544

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0870	1.0855	1.0841	1.0775	1.0763	1.0706	1.0706	1.0695	1.0728	1.0763	1.0788	1.0814	(40)
HLP (average)												1.0775	
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 1.7196 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	53.0510	52.2538	51.0920	48.8692	47.2288	45.3995	44.3597	45.5127	46.7765	48.7407	51.0112	52.8478	(42a)
Hot water usage for baths	22.9369	22.5963	22.1166	21.2321	20.5698	19.8354	19.4388	19.9151	20.4338	21.2196	22.1223	22.8594	(42b)
Hot water usage for other uses	32.2401	31.0678	29.8954	28.7230	27.5507	26.3783	26.3783	27.5507	28.7230	29.8954	31.0678	32.2401	(42c)

Average daily hot water use (litres/day) 99.4866 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	108.2281	105.9178	103.1040	98.8243	95.3493	91.6132	90.1768	92.9784	95.9333	99.8556	104.2013	107.9473	(44)
Energy conte	171.4068	150.8256	158.4670	135.2856	128.3585	112.6492	109.0610	115.1267	118.2954	135.5032	148.4538	169.0194	(45)
Energy content (annual)										Total = Sum(45)m =		1652.4520	
Distribution loss (46)m = 0.15 x (45)m	25.7110	22.6238	23.7701	20.2928	19.2538	16.8974	16.3591	17.2690	17.7443	20.3255	22.2681	25.3529	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9720	(55)
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	224.8012	199.0528	211.8614	186.9576	181.7529	164.3212	162.4554	168.5211	169.9674	188.8976	200.1258	222.4138	(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	224.8012	199.0528	211.8614	186.9576	181.7529	164.3212	162.4554	168.5211	169.9674	188.8976	200.1258	222.4138	(64)
										Total per year (kWh/year) = Sum(64)m =		2281.1280	(64)
12Total per year (kWh/year)												2281	(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	99.7083	88.7313	95.4058	86.3201	85.3947	78.7934	78.9783	80.9952	80.6708	87.7703	90.6985	98.9145	(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	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	75.5767	83.6742	75.5767	78.0959	75.5767	78.0959	75.5767	75.5767	78.0959	75.5767	78.0959	75.5767	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.8308	151.3856	147.4676	139.1267	128.5978	118.7021	112.0911	110.5364	114.4543	122.7953	133.3242	143.2199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	(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)	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	(71)
Water heating gains (Table 5)	134.0165	132.0406	128.2336	119.8890	114.7778	109.4353	106.1536	108.8645	112.0428	117.9709	125.9701	132.9495	(72)
Total internal gains													

	408.2176	415.8939	400.0715	385.9051	367.7459	355.0269	342.6150	343.7711	353.3866	365.1364	386.1838	400.5397 (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	4.8000	10.6334	0.7600	0.7000	0.7700	18.8173 (74)
East	2.0000	19.6403	0.7600	0.7000	0.7700	14.4818 (76)
South	4.5400	46.7521	0.7600	0.7000	0.7700	78.2531 (78)

Solar gains	111.5522	192.4487	271.0120	350.7045	407.8794	411.9430	394.2098	350.2257	298.2658	214.6529	134.0273	95.2140 (83)
Total gains	519.7698	608.3426	671.0834	736.6096	775.6252	766.9699	736.8249	693.9968	651.6524	579.7893	520.2111	495.7537 (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	86.8640	86.9786	87.0913	87.6247	87.7252	88.1961	88.1961	88.2839	88.0141	87.7252	87.5221	87.3108	
alpha	6.7909	6.7986	6.8061	6.8416	6.8483	6.8797	6.8797	6.8856	6.8676	6.8483	6.8348	6.8207	
util living area	0.9912	0.9751	0.9353	0.8237	0.6448	0.4545	0.3259	0.3613	0.5735	0.8657	0.9759	0.9934	(86)
Living	20.3220	20.5075	20.7124	20.9038	20.9829	20.9986	20.9999	20.9998	20.9937	20.8860	20.5749	20.2826	
Non living	19.2537	19.4847	19.7296	19.9392	20.0095	20.0244	20.0249	20.0258	20.0203	19.9288	19.5756	19.2078	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6531	20.5075	20.7124	20.9038	20.9829	20.9986	20.9999	20.9998	20.9937	20.8860	20.5749	20.3830	(87)
Th 2	20.0115	20.0127	20.0138	20.0192	20.0202	20.0249	20.0249	20.0258	20.0231	20.0202	20.0182	20.0160	(88)
util rest of house	0.9877	0.9659	0.9136	0.7784	0.5823	0.3858	0.2538	0.2849	0.4952	0.8175	0.9652	0.9907	(89)
MIT 2	19.7094	19.4847	19.7296	19.9392	20.0095	20.0244	20.0249	20.0258	20.0203	19.9288	19.5756	19.3534	(90)
Living area fraction										fLA = Living area / (4) =		0.4510	(91)
MIT	20.1350	19.9460	20.1728	20.3742	20.4485	20.4637	20.4646	20.4650	20.4593	20.3605	20.0263	19.8177	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1350	19.9460	20.1728	20.3742	20.4485	20.4637	20.4646	20.4650	20.4593	20.3605	20.0263	19.8177	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9882	0.9652	0.9175	0.7956	0.6101	0.4168	0.2863	0.3194	0.5305	0.8356	0.9653	0.9901	(94)
Useful gains	513.6303	587.1485	615.7493	586.0719	473.1961	319.6941	210.9749	221.6656	345.7309	484.4875	502.1742	490.8276	(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	877.8286	832.9898	755.9884	630.5611	480.2187	320.1521	211.0025	221.7240	347.9260	535.7691	711.1916	861.3539	(97)
Space heating kWh	270.9635	165.2054	104.3378	32.0322	5.2248	0.0000	0.0000	0.0000	0.0000	38.1535	150.4925	275.6716	(98a)
Space heating requirement - total per year (kWh/year)												1042.0813	
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	270.9635	165.2054	104.3378	32.0322	5.2248	0.0000	0.0000	0.0000	0.0000	38.1535	150.4925	275.6716	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1042.0813	
Space heating per m2										(98c) / (4) =		20.4330	(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 %)	255.9505 (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	270.9635	165.2054	104.3378	32.0322	5.2248	0.0000	0.0000	0.0000	0.0000	38.1535	150.4925	275.6716	(98)
Space heating efficiency (main heating system 1)	255.9505	255.9505	255.9505	255.9505	255.9505	0.0000	0.0000	0.0000	0.0000	255.9505	255.9505	255.9505	(210)
Space heating fuel (main heating system)	105.8656	64.5458	40.7648	12.5150	2.0413	0.0000	0.0000	0.0000	0.0000	14.9066	58.7975	107.7050	(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

	224.8012	199.0528	211.8614	186.9576	181.7529	164.3212	162.4554	168.5211	169.9674	188.8976	200.1258	222.4138 (64)
Efficiency of water heater												174.9895 (216)
(217)m	174.9895	174.9895	174.9895	174.9895	174.9895	174.9895	174.9895	174.9895	174.9895	174.9895	174.9895	174.9895 (217)
Fuel for water heating, kWh/month												
	128.4655	113.7513	121.0709	106.8393	103.8650	93.9034	92.8372	96.3036	97.1300	107.9479	114.3645	127.1012 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	19.0079	15.2489	13.7299	10.0591	7.7700	6.3481	7.0880	9.2133	11.9671	15.7015	17.7348	19.5362 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	407.1418 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	174.9895
Water heating fuel used	1303.5798 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	153.4048 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	1864.1264 (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	407.1418	0.1580	64.3412	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1303.5798	0.1408	183.5288	(264)
Space and water heating			247.8700	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	153.4048	0.1443	22.1411	(268)
Total CO2, kg/year			270.0110	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.2900	(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	407.1418	1.5850	645.3058	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1303.5798	1.5206	1982.1956	(278)
Space and water heating			2627.5014	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	153.4048	1.5338	235.2975	(282)
Total Primary energy kWh/year			2862.7989	(286)
Dwelling Primary energy Rate (DPER)			56.1300	(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	51.0000 (1b)	x	2.4000 (2b)	=	122.4000 (1b) -	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	122.4000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1634	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4134	(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) =	0.3514	(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	0.4480	0.4392	0.4305	0.3865	0.3777	0.3338	0.3338	0.3250	0.3514	0.3777	0.3953	0.4129	(22b)
Effective ac	0.6004	0.5965	0.5926	0.5747	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852	(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 Opening Type (Uw = 1.20)			11.3400	1.1450	12.9847			(27)
Heatloss Floor 1			51.0000	0.1300	6.6300			(28a)
External Wall 1	65.0000	11.3400	53.6600	0.1800	9.6588			(29a)
Total net area of external elements Aum(A, m2)			116.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.2735			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							349.9098	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	24.0000	0.1600	3.8400
E16 Corner (normal)	9.6000	0.0900	0.8640
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3 Sill	5.2000	0.0500	0.2600
E4 Jamb	24.0800	0.0500	1.2040
E7 Party floor between dwellings (in blocks of flats)	24.0000	0.0700	1.6800
E18 Party wall between dwellings	4.8000	0.0600	0.2880

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.5610	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	37.8345	(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	24.2498	24.0924	23.9381	23.2134	23.0778	22.4465	22.4465	22.3297	22.6897	23.0778	23.3521	23.6388	(38)
Heat transfer coeff	62.0843	61.9269	61.7726	61.0479	60.9123	60.2811	60.2811	60.1642	60.5242	60.9123	61.1866	61.4734	(39)
Average = Sum(39)m / 12 =												61.0472	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2173	1.2143	1.2112	1.1970	1.1944	1.1820	1.1820	1.1797	1.1867	1.1944	1.1997	1.2054	(40)
HLP (average)												1.1970	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7196	(42)
Hot water usage for mixer showers		

	53.0510	52.2538	51.0920	48.8692	47.2288	45.3995	44.3597	45.5127	46.7765	48.7407	51.0112	52.8478 (42a)
Hot water usage for baths												
	22.9369	22.5963	22.1166	21.2321	20.5698	19.8354	19.4388	19.9151	20.4338	21.2196	22.1223	22.8594 (42b)
Hot water usage for other uses												
	32.2401	31.0678	29.8954	28.7230	27.5507	26.3783	26.3783	27.5507	28.7230	29.8954	31.0678	32.2401 (42c)
Average daily hot water use (litres/day)												99.4866 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	108.2281	105.9178	103.1040	98.8243	95.3493	91.6132	90.1768	92.9784	95.9333	99.8556	104.2013	107.9473	(44)
Energy conte	171.4068	150.8256	158.4670	135.2856	128.3585	112.6492	109.0610	115.1267	118.2954	135.5032	148.4538	169.0194	(45)
Energy content (annual)										Total = Sum(45)m =		1652.4520	
Distribution loss (46)m = 0.15 x (45)m													
	25.7110	22.6238	23.7701	20.2928	19.2538	16.8974	16.3591	17.2690	17.7443	20.3255	22.2681	25.3529	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	218.0017	192.9113	205.0619	180.3774	174.9534	157.7410	155.6559	161.7216	163.3872	182.0981	193.5456	215.6143	(62)
WWHRS	-24.2527	-21.4493	-22.4605	-18.5982	-17.3328	-14.8318	-13.9025	-14.7839	-15.3456	-18.0907	-20.4946	-23.8036	(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													
	193.7490	171.4620	182.6014	161.7793	157.6206	142.9092	141.7534	146.9378	148.0416	164.0073	173.0510	191.8107	(64)
										Total per year (kWh/year) = Sum(64)m =		1975.7233	(64)
12Total per year (kWh/year)												1976	(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													
	94.2687	83.8181	89.9662	81.0559	79.9551	73.5293	73.5387	75.5556	75.4067	82.3307	85.4344	93.4749	(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	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	75.5767	83.6742	75.5767	78.0959	75.5767	78.0959	75.5767	75.5767	78.0959	75.5767	78.0959	75.5767	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	149.8308	151.3856	147.4676	139.1267	128.5978	118.7021	112.0911	110.5364	114.4543	122.7953	133.3242	143.2199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	(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)													
	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	(71)
Water heating gains (Table 5)													
	126.7052	124.7293	120.9223	112.5777	107.4666	102.1240	98.8423	101.5532	104.7315	110.6596	118.6588	125.6383	(72)
Total internal gains													
	403.9063	411.5826	395.7602	381.5938	363.4346	347.7156	335.3037	336.4598	346.0753	360.8251	381.8725	396.2284	(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	4.8000	10.6334	0.6300	0.7000	0.7700	15.5986	(74)
East	2.0000	19.6403	0.6300	0.7000	0.7700	12.0046	(76)
South	4.5400	46.7521	0.6300	0.7000	0.7700	64.8677	(78)

Solar gains	92.4709	159.5299	224.6546	290.7155	338.1105	341.4791	326.7792	290.3187	247.2467	177.9359	111.1016	78.9274	(83)
Total gains	496.3772	571.1125	620.4148	672.3094	701.5451	689.1947	662.0829	626.7785	593.3220	538.7610	492.9741	475.1558	(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	79.8439	80.0469	80.2468	81.1995	81.3802	82.2324	82.2324	82.3921	81.9020	81.3802	81.0154	80.6374	
alpha	6.3229	6.3365	6.3498	6.4133	6.4253	6.4822	6.4822	6.4928	6.4601	6.4253	6.4010	6.3758	
util living area													
	0.9950	0.9873	0.9680	0.9022	0.7580	0.5540	0.4000	0.4403	0.6806	0.9245	0.9870	0.9962	(86)
MIT	20.1408	20.3142	20.5325	20.7903	20.9449	20.9936	20.9993	20.9988	20.9781	20.7850	20.4226	20.1132	(87)

Th 2	19.9062	19.9086	19.9110	19.9224	19.9245	19.9344	19.9344	19.9363	19.9306	19.9245	19.9202	19.9157	(88)
util rest of house	0.9928	0.9819	0.9545	0.8655	0.6885	0.4648	0.3035	0.3392	0.5862	0.8871	0.9804	0.9945	(89)
MIT 2	18.9394	19.1596	19.4309	19.7370	19.8880	19.9319	19.9343	19.9360	19.9202	19.7410	19.3072	18.9118	(90)
Living area fraction										fLA = Living area / (4) =		0.4510	(91)
MIT	19.4812	19.6803	19.9277	20.2121	20.3646	20.4107	20.4146	20.4153	20.3973	20.2119	19.8103	19.4536	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4812	19.6803	19.9277	20.2121	20.3646	20.4107	20.4146	20.4153	20.3973	20.2119	19.8103	19.4536	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9917	0.9805	0.9548	0.8764	0.7183	0.5051	0.3471	0.3849	0.6287	0.8985	0.9795	0.9935	(94)
Useful gains	492.2639	559.9478	592.3596	589.2247	503.8990	348.1218	229.7909	241.2732	373.0273	484.0726	482.8756	472.0618	(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	942.5166	915.2996	829.4660	690.5773	527.7836	350.2777	229.9491	241.5776	381.1390	585.4809	777.6980	937.6913	(97)
Space heating kWh	334.9880	238.7964	176.4072	72.9739	17.7701	0.0000	0.0000	0.0000	0.0000	75.4478	212.2721	346.4283	(98a)
Space heating requirement - total per year (kWh/year)												1475.0837	
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	334.9880	238.7964	176.4072	72.9739	17.7701	0.0000	0.0000	0.0000	0.0000	75.4478	212.2721	346.4283	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1475.0837	
Space heating per m2											(98c) / (4) =	28.9232	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	334.9880	238.7964	176.4072	72.9739	17.7701	0.0000	0.0000	0.0000	0.0000	75.4478	212.2721	346.4283	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	362.9339	258.7177	191.1237	79.0616	19.2526	0.0000	0.0000	0.0000	0.0000	81.7419	229.9806	375.3286	(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	193.7490	171.4620	182.6014	161.7793	157.6206	142.9092	141.7534	146.9378	148.0416	164.0073	173.0510	191.8107	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2758	84.8028	83.9824	82.3959	80.6279	79.8000	79.8000	79.8000	79.8000	82.4324	84.5190	85.3689	(217)
Fuel for water heating, kWh/month	227.2029	202.1891	217.4281	196.3438	195.4913	179.0842	177.6359	184.1325	185.5158	198.9598	204.7480	224.6845	(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	15.7033	12.5978	11.3429	8.3103	6.4191	5.2445	5.8557	7.6115	9.8866	12.9718	14.6516	16.1398	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.5485	-25.6461	-38.2111	-44.6061	-49.5572	-46.8214	-46.2779	-42.9807	-37.3882	-30.0788	-19.6221	-15.0700	(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	-7.3428	-15.6817	-31.5976	-48.0784	-64.1617	-64.6533	-63.8632	-53.7796	-39.0537	-22.5987	-9.8620	-5.7870	(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	1598.1405 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2393.4160 (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)	126.7350 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-840.2676 (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	3364.0240 (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	1598.1405	0.2100	335.6095	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2393.4160	0.2100	502.6174	(264)
Space and water heating			838.2269	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	126.7350	0.1443	18.2918	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-413.8080	0.1338	-55.3710	
PV Unit electricity exported	-426.4596	0.1255	-53.5325	
Total			-108.9035	(269)
Total CO2, kg/year			759.5444	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.8900	(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	1598.1405	1.1300	1805.8988	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2393.4160	1.1300	2704.5601	(278)
Space and water heating			4510.4589	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	126.7350	1.5338	194.3904	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-413.8080	1.4945	-618.4313	
PV Unit electricity exported	-426.4596	0.4608	-196.4943	
Total			-814.9257	(283)
Total Primary energy kWh/year			4020.0244	(286)
Target Primary Energy Rate (TPER)			78.8200	(287)

Full SAP Calculation Printout

Property Reference	House Type A	Issued on Date	05/10/2023
Assessment Reference	Plot 32	Prop Type Ref	
Property			

SAP Rating	83 B	DER	4.61	TER	11.83
Environmental	97 A	% DER < TER			61.03
CO_2 Emissions (t/year)	0.25	DFEE	23.14	TFEE	26.80
Compliance Check	See BREL	% DFEE < TFEE			13.66
% DPER < TPER	21.24	DPER	49.03	TPER	62.25

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	57.0000 (1b)	x	2.4000 (2b)	=	136.8000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	136.8000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0731	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2731	(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) =	0.2321	(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	0.2960	0.2902	0.2844	0.2553	0.2495	0.2205	0.2205	0.2147	0.2321	0.2495	0.2612	0.2728	(22b)
Effective ac	0.5438	0.5421	0.5404	0.5326	0.5311	0.5243	0.5243	0.5231	0.5269	0.5311	0.5341	0.5372	(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	
Opening Type 1 (Uw = 1.20)			13.7000	1.1450	15.6870			(27)
External Wall 1	60.0000	13.7000	46.3000	0.1900	8.7970	190.0000	8797.0000	(29a)
Total net area of external elements Aum(A, m2)			60.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.4840			(33)
Party Floor 1			57.0000			40.0000	2280.0000	(32d)
Party Ceiling 1			57.0000			30.0000	1710.0000	(32b)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12787.0000	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 224.3333 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	9.6000	0.0410	0.3936
E2 Other lintels (including other steel lintels)	8.5000	0.0240	0.2040
E3 Sill	5.2000	0.0190	0.0988
E4 Jamb	24.0800	0.0140	0.3371
E7 Party floor between dwellings (in blocks of flats)	44.0000	0.0510	2.2440
E18 Party wall between dwellings	4.8000	0.0400	0.1920

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.4695 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.9535 (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	24.5493	24.4725	24.3972	24.0438	23.9776	23.6697	23.6697	23.6127	23.7883	23.9776	24.1114	24.2513	(38)
Heat transfer coeff	52.5028	52.4260	52.3508	51.9973	51.9312	51.6233	51.6233	51.5663	51.7419	51.9312	52.0650	52.2048	(39)

Average = Sum(39)m / 12 = 51.9970

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9211	0.9198	0.9184	0.9122	0.9111	0.9057	0.9057	0.9047	0.9078	0.9111	0.9134	0.9159	(40)
HLP (average)												0.9122	
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 1.8957 (42)
Hot water usage for mixer showers

56.0037	55.1621	53.9357	51.5892	49.8575	47.9263	46.8287	48.0458	49.3800	51.4535	53.8504	55.7892	(42a)

Hot water usage for baths

24.2067	23.8472	23.3409	22.4075	21.7085	20.9335	20.5149	21.0176	21.5649	22.3942	23.3469	24.1248	(42b)

Hot water usage for other uses

34.0436	32.8056	31.5677	30.3297	29.0918	27.8538	27.8538	29.0918	30.3297	31.5677	32.8056	34.0436	(42c)

Average daily hot water use (litres/day) 105.0257 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.2540	111.8149	108.8443	104.3263	100.6578	96.7136	95.1973	98.1551	101.2747	105.4154	110.0029	113.9576	(44)
Energy conte	180.9503	159.2229	167.2896	142.8176	135.5047	118.9207	115.1329	121.5366	124.8818	143.0477	156.7193	178.4300	(45)

Energy content (annual) Total = Sum(45)m = 1744.4541

Distribution loss (46)m = 0.15 x (45)m	27.1426	23.8834	25.0934	21.4226	20.3257	17.8381	17.2699	18.2305	18.7323	21.4572	23.5079	26.7645	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

234.3447	207.4501	220.6840	194.4896	188.8991	170.5927	168.5273	174.9310	176.5538	196.4421	208.3913	231.8244	(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

234.3447	207.4501	220.6840	194.4896	188.8991	170.5927	168.5273	174.9310	176.5538	196.4421	208.3913	231.8244	(64)

Total per year (kWh/year) = Sum(64)m = 2373.1301 (64)
12Total per year (kWh/year) 2373 (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

102.8815	91.5234	98.3393	88.8244	87.7708	80.8787	80.9972	83.1264	82.8608	90.2789	93.4468	102.0435	(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	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.3863	92.3205	83.3863	86.1658	83.3863	86.1658	83.3863	83.3863	86.1658	83.3863	86.1658	83.3863	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	165.3227	167.0382	162.7151	153.5118	141.8942	130.9753	123.6809	121.9653	126.2884	135.4918	147.1093	158.0282	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	(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)	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	(71)
Water heating gains (Table 5)	138.2816	136.1955	132.1765	123.3673	117.9716	112.3316	108.8672	111.7291	115.0844	121.3426	129.7872	137.1552	(72)
Total internal gains	438.4256	446.9893	429.7130	414.4800	394.6871	380.9078	367.3695	368.5158	378.9738	391.6557	414.4974	430.0048	(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	3.2000	10.6334	0.7600	0.7000	0.7700	12.5449	(74)
South	4.8000	46.7521	0.7600	0.7000	0.7700	82.7345	(78)
West	5.7000	19.6403	0.7600	0.7000	0.7700	41.2731	(80)

Solar gains	136.5525	240.2107	346.3033	454.4330	529.0869	533.2804	510.8619	454.4796	383.9255	270.4885	165.0071	115.8893	(83)
Total gains	574.9782	687.2000	776.0163	868.9129	923.7740	914.1883	878.2314	822.9954	762.8992	662.1442	579.5045	545.8941	(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	67.6524	67.7515	67.8489	68.3102	68.3972	68.8051	68.8051	68.8812	68.6474	68.3972	68.2214	68.0386	
alpha	5.5102	5.5168	5.5233	5.5540	5.5598	5.5870	5.5870	5.5921	5.5765	5.5598	5.5481	5.5359	
util living area													
	0.9640	0.9190	0.8372	0.6863	0.5159	0.3606	0.2585	0.2880	0.4643	0.7500	0.9242	0.9713	(86)
Living	20.3085	20.5442	20.7653	20.9294	20.9864	20.9985	20.9998	20.9997	20.9940	20.9065	20.5961	20.2557	
Non living	19.3720	19.6578	19.9144	20.0937	20.1478	20.1618	20.1626	20.1634	20.1573	20.0768	19.7299	19.3103	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6463	20.5442	20.7653	20.9294	20.9864	20.9985	20.9998	20.9997	20.9940	20.9065	20.5961	20.3598	(87)
Th 2	20.1496	20.1507	20.1519	20.1571	20.1581	20.1627	20.1627	20.1635	20.1609	20.1581	20.1561	20.1540	(88)
util rest of house													
	0.9557	0.9028	0.8098	0.6472	0.4715	0.3138	0.2094	0.2358	0.4094	0.7051	0.9061	0.9645	(89)
MIT 2	19.8396	19.6578	19.9144	20.0937	20.1478	20.1618	20.1626	20.1634	20.1573	20.0768	19.7299	19.4623	(90)
Living area fraction										fLA = Living area / (4) =		0.4912	(91)
MIT	20.2359	20.0933	20.3324	20.5042	20.5597	20.5728	20.5739	20.5742	20.5683	20.4844	20.1554	19.9032	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2359	20.0933	20.3324	20.5042	20.5597	20.5728	20.5739	20.5742	20.5683	20.4844	20.1554	19.9032	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9566	0.9016	0.8160	0.6636	0.4928	0.3368	0.2335	0.2614	0.4362	0.7231	0.9061	0.9622	(94)
Useful gains	550.0451	619.5963	633.1927	576.6076	455.2553	307.8644	205.0976	215.1596	332.7773	478.8001	525.0978	525.2417	(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													
	836.6778	796.5223	724.1368	603.3878	460.0966	308.3360	205.1442	215.2476	334.6842	513.3080	679.7287	819.7817	(97)
Space heating kWh													
	213.2547	118.8942	67.6624	19.2818	3.6019	0.0000	0.0000	0.0000	0.0000	25.6739	111.3342	219.1377	(98a)
Space heating requirement - total per year (kWh/year)												778.8408	
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													
	213.2547	118.8942	67.6624	19.2818	3.6019	0.0000	0.0000	0.0000	0.0000	25.6739	111.3342	219.1377	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												778.8408	
Space heating per m2											(98c) / (4) =	13.6639	(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 %)	257.2276 (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													
	213.2547	118.8942	67.6624	19.2818	3.6019	0.0000	0.0000	0.0000	0.0000	25.6739	111.3342	219.1377	(98)
Space heating efficiency (main heating system 1)													
	257.2276	257.2276	257.2276	257.2276	257.2276	0.0000	0.0000	0.0000	0.0000	257.2276	257.2276	257.2276	(210)
Space heating fuel (main heating system)													
	82.9051	46.2214	26.3045	7.4960	1.4003	0.0000	0.0000	0.0000	0.0000	9.9810	43.2824	85.1922	(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

	234.3447	207.4501	220.6840	194.4896	188.8991	170.5927	168.5273	174.9310	176.5538	196.4421	208.3913	231.8244 (64)
Efficiency of water heater												175.9277 (216)
(217)m	175.9277	175.9277	175.9277	175.9277	175.9277	175.9277	175.9277	175.9277	175.9277	175.9277	175.9277	175.9277 (217)
Fuel for water heating, kWh/month												
	133.2052	117.9178	125.4402	110.5509	107.3732	96.9675	95.7935	99.4335	100.3559	111.6607	118.4528	131.7726 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	21.2549	17.0515	15.3530	11.2482	8.6885	7.0986	7.9259	10.3024	13.3818	17.5576	19.8313	21.8457 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	302.7828 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	175.9277
Water heating fuel used	1348.9237 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	171.5394 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	1823.2459 (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	302.7828	0.1584	47.9697	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1348.9237	0.1408	189.9540	(264)
Space and water heating			237.9237	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	171.5394	0.1443	24.7584	(268)
Total CO2, kg/year			262.6821	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6100	(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	302.7828	1.5864	480.3348	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1348.9237	1.5207	2051.2993	(278)
Space and water heating			2531.6341	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	171.5394	1.5338	263.1129	(282)
Total Primary energy kWh/year			2794.7469	(286)
Dwelling Primary energy Rate (DPER)			49.0300	(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	57.0000 (1b)	x	2.4000 (2b)	=	136.8000 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	136.8000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1462	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3962	(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) =	0.3368	(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	0.4294	0.4210	0.4125	0.3704	0.3620	0.3199	0.3199	0.3115	0.3368	0.3620	0.3789	0.3957	(22b)
Effective ac	0.5922	0.5886	0.5851	0.5686	0.5655	0.5512	0.5512	0.5485	0.5567	0.5655	0.5718	0.5783	(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 Opening Type (Uw = 1.20)			13.7000	1.1450	15.6870			(27)
External Wall 1	60.0000	13.7000	46.3000	0.1800	8.3340			(29a)
Total net area of external elements Aum(A, m2)			60.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.0210			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 234.3333 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	9.6000	0.0900	0.8640
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3 Sill	5.2000	0.0500	0.2600
E4 Jamb	24.0800	0.0500	1.2040
E7 Party floor between dwellings (in blocks of flats)	44.0000	0.0700	3.0800
E18 Party wall between dwellings	4.8000	0.0600	0.2880

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.1210	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	30.1420	(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	26.7335	26.5719	26.4135	25.6696	25.5304	24.8824	24.8824	24.7624	25.1320	25.5304	25.8120	26.1064	(38)
Heat transfer coeff	56.8756	56.7140	56.5556	55.8116	55.6724	55.0244	55.0244	54.9044	55.2740	55.6724	55.9540	56.2484	(39)
Average = Sum(39)m / 12 =												55.8109	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9978	0.9950	0.9922	0.9792	0.9767	0.9653	0.9653	0.9632	0.9697	0.9767	0.9816	0.9868	(40)
HLP (average)												0.9791	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8957 (42)

Hot water usage for mixer showers

56.0037	55.1621	53.9357	51.5892	49.8575	47.9263	46.8287	48.0458	49.3800	51.4535	53.8504	55.7892 (42a)

Hot water usage for baths

24.2067	23.8472	23.3409	22.4075	21.7085	20.9335	20.5149	21.0176	21.5649	22.3942	23.3469	24.1248 (42b)

Hot water usage for other uses

	34.0436	32.8056	31.5677	30.3297	29.0918	27.8538	27.8538	29.0918	30.3297	31.5677	32.8056	34.0436 (42c)

Average daily hot water use (litres/day) 105.0257 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	114.2540	111.8149	108.8443	104.3263	100.6578	96.7136	95.1973	98.1551	101.2747	105.4154	110.0029	113.9576	(44)
Energy conte	180.9503	159.2229	167.2896	142.8176	135.5047	118.9207	115.1329	121.5366	124.8818	143.0477	156.7193	178.4300	(45)
Energy content (annual)										Total = Sum(45)m =		1744.4541	
Distribution loss (46)m = 0.15 x (45)m													
	27.1426	23.8834	25.0934	21.4226	20.3257	17.8381	17.2699	18.2305	18.7323	21.4572	23.5079	26.7645	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	227.5452	201.3086	213.8845	187.9094	182.0996	164.0126	161.7278	168.1315	169.9736	189.6426	201.8112	225.0249	(62)
WWHRS	-25.6026	-22.6431	-23.7106	-19.6333	-18.2975	-15.6573	-14.6762	-15.6067	-16.1997	-19.0976	-21.6353	-25.1284	(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													
	201.9427	178.6655	190.1739	168.2761	163.8021	148.3552	147.0516	152.5248	153.7740	170.5450	180.1759	199.8964	(64)
										Total per year (kWh/year) = Sum(64)m =		2055.1832	(64)
12Total per year (kWh/year)												2055	(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													
	97.4419	86.6102	92.8997	83.5603	82.3312	75.6146	75.5576	77.6868	77.5967	84.8393	88.1827	96.6039	(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	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	83.3863	92.3205	83.3863	86.1658	83.3863	86.1658	83.3863	83.3863	86.1658	83.3863	86.1658	83.3863	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	165.3227	167.0382	162.7151	153.5118	141.8942	130.9753	123.6809	121.9653	126.2884	135.4918	147.1093	158.0282	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	(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)													
	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	(71)
Water heating gains (Table 5)													
	130.9703	128.8842	124.8652	116.0560	110.6603	105.0203	101.5559	104.4178	107.7731	114.0313	122.4759	129.8439	(72)
Total internal gains													
	434.1144	442.6780	425.4017	410.1687	390.3759	373.5966	360.0582	361.2045	371.6625	387.3444	410.1861	425.6935	(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	3.2000	10.6334	0.6300	0.7000	0.7700	10.3990	(74)
South	4.8000	46.7521	0.6300	0.7000	0.7700	68.5826	(78)
West	5.7000	19.6403	0.6300	0.7000	0.7700	34.2132	(80)

Solar gains	113.1949	199.1220	287.0672	376.7010	438.5852	442.0614	423.4776	376.7396	318.2540	224.2208	136.7822	96.0661	(83)
Total gains	547.3092	641.8001	712.4689	786.8697	828.9610	815.6580	783.5358	737.9441	689.9165	611.5652	546.9683	521.7596	(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	65.2350	65.4209	65.6041	66.4786	66.6449	67.4297	67.4297	67.5771	67.1252	66.6449	66.3095	65.9624	
alpha	5.3490	5.3614	5.3736	5.4319	5.4430	5.4953	5.4953	5.5051	5.4750	5.4430	5.4206	5.3975	
util living area													
	0.9771	0.9498	0.8959	0.7735	0.6056	0.4293	0.3087	0.3416	0.5430	0.8208	0.9509	0.9814	(86)
MIT	20.1541	20.3811	20.6292	20.8636	20.9678	20.9959	20.9995	20.9991	20.9861	20.8423	20.4731	20.1158	(87)
Th 2	20.0852	20.0875	20.0898	20.1007	20.1028	20.1123	20.1123	20.1141	20.1086	20.1028	20.0987	20.0943	(88)
util rest of house													
	0.9711	0.9378	0.8732	0.7339	0.5531	0.3708	0.2466	0.2762	0.4768	0.7777	0.9370	0.9765	(89)

MIT 2	19.1272	19.4086	19.7064	19.9756	20.0784	20.1101	20.1121	20.1138	20.1003	19.9625	19.5350	19.0865 (90)
Living area fraction										fLA = Living area / (4) =		0.4912 (91)
MIT	19.6316	19.8863	20.1597	20.4118	20.5153	20.5453	20.5480	20.5486	20.5354	20.3947	19.9959	19.5921 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6316	19.8863	20.1597	20.4118	20.5153	20.5453	20.5480	20.5486	20.5354	20.3947	19.9959	19.5921 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9675	0.9348	0.8751	0.7481	0.5776	0.3995	0.2771	0.3083	0.5089	0.7926	0.9352	0.9731	(94)
Useful gains	529.5118	599.9241	623.4974	588.6862	478.8151	325.8374	217.1010	227.5351	351.0645	484.7064	511.4991	507.7350	(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	871.9949	849.9310	772.5324	642.4933	490.7673	327.1340	217.2372	227.7789	355.7113	545.2933	721.5746	865.7807	(97)
Space heating kWh	254.8074	168.0046	110.8821	38.7411	8.8924	0.0000	0.0000	0.0000	0.0000	45.0766	151.2543	266.3860	(98a)
Space heating requirement - total per year (kWh/year)												1044.0445	
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	254.8074	168.0046	110.8821	38.7411	8.8924	0.0000	0.0000	0.0000	0.0000	45.0766	151.2543	266.3860	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1044.0445	
Space heating per m2											(98c) / (4) =	18.3166	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	254.8074	168.0046	110.8821	38.7411	8.8924	0.0000	0.0000	0.0000	0.0000	45.0766	151.2543	266.3860	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	276.0644	182.0201	120.1322	41.9730	9.6343	0.0000	0.0000	0.0000	0.0000	48.8371	163.8725	288.6088	(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	201.9427	178.6655	190.1739	168.2761	163.8021	148.3552	147.0516	152.5248	153.7740	170.5450	180.1759	199.8964	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5824	83.9220	82.8943	81.3428	80.2186	79.8000	79.8000	79.8000	79.8000	81.5274	83.6700	84.7045	(217)
Fuel for water heating, kWh/month	238.7527	212.8947	229.4172	206.8727	204.1945	185.9088	184.2752	191.1338	192.6992	209.1873	215.3410	235.9926	(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	17.3260	13.8996	12.5150	9.1690	7.0824	5.7864	6.4608	8.3980	10.9082	14.3122	16.1656	17.8076	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.5372	-28.5120	-42.4180	-49.4345	-54.8402	-51.7717	-51.1593	-47.5477	-41.4192	-33.3931	-21.8277	-16.7814	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.2826	-17.6778	-35.6035	-54.1540	-72.2574	-72.8176	-71.9395	-60.5961	-44.0160	-25.4817	-11.1251	-6.5293	(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												1131.1424	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2506.6698	(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)												139.8310	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-939.1226	(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	2924.5205 (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	1131.1424	0.2100	237.5399	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2506.6698	0.2100	526.4006	(264)
Space and water heating			763.9406	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	139.8310	0.1443	20.1819	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-458.6420	0.1338	-61.3871	
PV Unit electricity exported	-480.4806	0.1255	-60.3167	
Total			-121.7038	(269)
Total CO2, kg/year			674.3480	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.8300	(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	1131.1424	1.1300	1278.1909	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2506.6698	1.1300	2832.5368	(278)
Space and water heating			4110.7278	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	139.8310	1.5338	214.4774	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-458.6420	1.4946	-685.4989	
PV Unit electricity exported	-480.4806	0.4608	-221.3960	
Total			-906.8949	(283)
Total Primary energy kWh/year			3548.4110	(286)
Target Primary Energy Rate (TPER)			62.2500	(287)

Full SAP Calculation Printout

Property Reference	House Type A	Issued on Date	05/10/2023
Assessment Reference	Plot 33	Prop Type Ref	
Property			

SAP Rating	84 B	DER	4.51	TER	11.50
Environmental	97 A	% DER < TER			60.78
CO_2 Emissions (t/year)	0.24	DFEE	20.73	TFEE	24.54
Compliance Check	See BREL	% DFEE < TFEE			15.51
% DPER < TPER	20.52	DPER	48.09	TPER	60.50

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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		57.0000 (1b)	x	2.4000 (2b)	=	136.8000 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	136.8000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0731	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2731	(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) =	0.2321	(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	0.2960	0.2902	0.2844	0.2553	0.2495	0.2205	0.2205	0.2147	0.2321	0.2495	0.2612	0.2728	(22b)
Effective ac	0.5438	0.5421	0.5404	0.5326	0.5311	0.5243	0.5243	0.5231	0.5269	0.5311	0.5341	0.5372	(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	
Opening Type 1 (Uw = 1.20)			10.4000	1.1450	11.9084			(27)
External Wall 1	60.0000	10.4000	49.6000	0.1900	9.4240	190.0000	9424.0000	(29a)
Total net area of external elements Aum(A, m2)			60.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.3324			(33)
Party Floor 1			57.0000			40.0000	2280.0000	(32d)
Party Ceiling 1			57.0000			30.0000	1710.0000	(32b)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13414.0000 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 235.3333 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	9.6000	0.0410	0.3936
E2 Other lintels (including other steel lintels)	8.5000	0.0240	0.2040
E3 Sill	5.2000	0.0190	0.0988
E4 Jamb	24.0800	0.0140	0.3371
E7 Party floor between dwellings (in blocks of flats)	44.0000	0.0510	2.2440
E18 Party wall between dwellings	4.8000	0.0400	0.1920

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.4695 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 24.8019 (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	24.5493	24.4725	24.3972	24.0438	23.9776	23.6697	23.6697	23.6127	23.7883	23.9776	24.1114	24.2513	(38)
Heat transfer coeff	49.3512	49.2744	49.1992	48.8457	48.7795	48.4716	48.4716	48.4146	48.5902	48.7795	48.9133	49.0532	(39)

Average = Sum(39)m / 12 = 48.8454

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8658	0.8645	0.8631	0.8569	0.8558	0.8504	0.8504	0.8494	0.8525	0.8558	0.8581	0.8606	(40)
HLP (average)												0.8569	
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 1.8957 (42)

Hot water usage for mixer showers

56.0037	55.1621	53.9357	51.5892	49.8575	47.9263	46.8287	48.0458	49.3800	51.4535	53.8504	55.7892	(42a)

Hot water usage for baths

24.2067	23.8472	23.3409	22.4075	21.7085	20.9335	20.5149	21.0176	21.5649	22.3942	23.3469	24.1248	(42b)

Hot water usage for other uses

34.0436	32.8056	31.5677	30.3297	29.0918	27.8538	27.8538	29.0918	30.3297	31.5677	32.8056	34.0436	(42c)

Average daily hot water use (litres/day) 105.0257 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	114.2540	111.8149	108.8443	104.3263	100.6578	96.7136	95.1973	98.1551	101.2747	105.4154	110.0029	113.9576	(44)
Energy conte	180.9503	159.2229	167.2896	142.8176	135.5047	118.9207	115.1329	121.5366	124.8818	143.0477	156.7193	178.4300	(45)

Energy content (annual) Total = Sum(45)m = 1744.4541

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

27.1426	23.8834	25.0934	21.4226	20.3257	17.8381	17.2699	18.2305	18.7323	21.4572	23.5079	26.7645	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9720 (55)

Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

234.3447	207.4501	220.6840	194.4896	188.8991	170.5927	168.5273	174.9310	176.5538	196.4421	208.3913	231.8244	(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

234.3447	207.4501	220.6840	194.4896	188.8991	170.5927	168.5273	174.9310	176.5538	196.4421	208.3913	231.8244	(64)

Total per year (kWh/year) = Sum(64)m = 2373.1301 (64)

12Total per year (kWh/year) 2373 (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

102.8815	91.5234	98.3393	88.8244	87.7708	80.8787	80.9972	83.1264	82.8608	90.2789	93.4468	102.0435	(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	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	84.9863	94.0920	84.9863	87.8192	84.9863	87.8192	84.9863	84.9863	87.8192	84.9863	87.8192	84.9863	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	165.3227	167.0382	162.7151	153.5118	141.8942	130.9753	123.6809	121.9653	126.2884	135.4918	147.1093	158.0282	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	(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)	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	(71)
Water heating gains (Table 5)	138.2816	136.1955	132.1765	123.3673	117.9716	112.3316	108.8672	111.7291	115.0844	121.3426	129.7872	137.1552	(72)
Total internal gains	440.0257	448.7608	431.3130	416.1333	396.2872	382.5612	368.9695	370.1158	380.6272	393.2558	416.1508	431.6048	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	3.0000	10.6334	0.7600	0.7000	0.7700	11.7608 (74)
East	2.0000	19.6403	0.7600	0.7000	0.7700	14.4818 (76)
South	5.4000	46.7521	0.7600	0.7000	0.7700	93.0764 (78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	119.3190	203.2401	279.0213	348.8484	394.7179	393.9138	378.8996	344.1669	303.0187	224.7850	142.8928	102.1401	(83)
Total gains	559.3447	652.0009	710.3343	764.9817	791.0051	776.4750	747.8691	714.2827	683.6459	618.0408	559.0436	533.7449	(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	75.5019	75.6196	75.7353	76.2833	76.3868	76.8720	76.8720	76.9625	76.6844	76.3868	76.1778	75.9606	
alpha	6.0335	6.0413	6.0490	6.0856	6.0925	6.1248	6.1248	6.1308	6.1123	6.0925	6.0785	6.0640	
util living area	0.9668	0.9273	0.8600	0.7291	0.5651	0.3987	0.2851	0.3116	0.4872	0.7622	0.9279	0.9735	(86)
Living	20.4091	20.6063	20.7861	20.9304	20.9861	20.9986	20.9999	20.9997	20.9954	20.9243	20.6634	20.3643	
Non living	19.5326	19.7721	19.9818	20.1414	20.1948	20.2091	20.2098	20.2106	20.2053	20.1398	19.8493	19.4811	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6977	20.6063	20.7861	20.9304	20.9861	20.9986	20.9999	20.9997	20.9954	20.9243	20.6634	20.4533	(87)
Th 2	20.1967	20.1978	20.1989	20.2043	20.2052	20.2099	20.2099	20.2107	20.2081	20.2052	20.2032	20.2011	(88)
util rest of house	0.9589	0.9122	0.8346	0.6911	0.5196	0.3498	0.2339	0.2582	0.4326	0.7186	0.9102	0.9670	(89)
MIT 2	19.9319	19.7721	19.9818	20.1414	20.1948	20.2091	20.2098	20.2106	20.2053	20.1398	19.8493	19.6109	(90)
Living area fraction									fLA = Living area / (4) =			0.4912	(91)
MIT	20.3081	20.1819	20.3769	20.5290	20.5835	20.5969	20.5979	20.5983	20.5934	20.5252	20.2492	20.0247	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3081	20.1819	20.3769	20.5290	20.5835	20.5969	20.5979	20.5983	20.5934	20.5252	20.2492	20.0247	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9601	0.9118	0.8406	0.7070	0.5414	0.3738	0.2591	0.2845	0.4593	0.7368	0.9113	0.9653	(94)
Useful gains	537.0420	594.5133	597.0911	540.8294	428.2509	290.2376	193.7487	203.1925	314.0059	455.3548	509.4810	515.2274	(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	790.0193	753.0058	682.7312	568.0248	433.3317	290.6808	193.7854	203.2580	315.5175	484.1461	643.1703	776.2510	(97)
Space heating kWh	188.2151	106.5070	63.7162	19.5807	3.7802	0.0000	0.0000	0.0000	0.0000	21.4208	96.2563	194.2016	(98a)
Space heating requirement - total per year (kWh/year)												693.6778	
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	188.2151	106.5070	63.7162	19.5807	3.7802	0.0000	0.0000	0.0000	0.0000	21.4208	96.2563	194.2016	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												693.6778	
Space heating per m2											(98c) / (4) =	12.1698	(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 %)	258.5439 (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	188.2151	106.5070	63.7162	19.5807	3.7802	0.0000	0.0000	0.0000	0.0000	21.4208	96.2563	194.2016	(98)
Space heating efficiency (main heating system 1)	258.5439	258.5439	258.5439	258.5439	258.5439	0.0000	0.0000	0.0000	0.0000	258.5439	258.5439	258.5439	(210)
Space heating fuel (main heating system)	72.7981	41.1949	24.6443	7.5735	1.4621	0.0000	0.0000	0.0000	0.0000	8.2851	37.2301	75.1136	(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

	234.3447	207.4501	220.6840	194.4896	188.8991	170.5927	168.5273	174.9310	176.5538	196.4421	208.3913	231.8244 (64)
Efficiency of water heater												176.2838 (216)
(217)m	176.2838	176.2838	176.2838	176.2838	176.2838	176.2838	176.2838	176.2838	176.2838	176.2838	176.2838	176.2838 (217)
Fuel for water heating, kWh/month												
	132.9360	117.6796	125.1867	110.3275	107.1562	96.7716	95.6000	99.2326	100.1531	111.4351	118.2135	131.5063 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	21.6628	17.3787	15.6476	11.4641	8.8552	7.2348	8.0780	10.5001	13.6386	17.8945	20.2119	22.2648 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	268.3017 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	176.2838
Water heating fuel used	1346.1984 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	174.8310 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	1789.3310 (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	268.3017	0.1584	42.4959	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1346.1984	0.1408	189.5702	(264)
Space and water heating			232.0661	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	174.8310	0.1443	25.2335	(268)
Total CO2, kg/year			257.2996	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5100	(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	268.3017	1.5863	425.5974	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1346.1984	1.5207	2047.1550	(278)
Space and water heating			2472.7524	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	174.8310	1.5338	268.1616	(282)
Total Primary energy kWh/year			2740.9139	(286)
Dwelling Primary energy Rate (DPER)			48.0900	(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	57.0000 (1b)	x	2.4000 (2b)	=	136.8000 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	57.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	136.8000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1462	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3962	(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) =	0.3368	(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	0.4294	0.4210	0.4125	0.3704	0.3620	0.3199	0.3199	0.3115	0.3368	0.3620	0.3789	0.3957	(22b)
Effective ac	0.5922	0.5886	0.5851	0.5686	0.5655	0.5512	0.5512	0.5485	0.5567	0.5655	0.5718	0.5783	(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 Opening Type (Uw = 1.20)			10.4000	1.1450	11.9084			(27)
External Wall 1	60.0000	10.4000	49.6000	0.1800	8.9280			(29a)
Total net area of external elements Aum(A, m2)			60.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.8364			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 245.3333 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	9.6000	0.0900	0.8640
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3 Sill	5.2000	0.0500	0.2600
E4 Jamb	24.0800	0.0500	1.2040
E7 Party floor between dwellings (in blocks of flats)	44.0000	0.0700	3.0800
E18 Party wall between dwellings	4.8000	0.0600	0.2880

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.1210	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	26.9574	(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	26.7335	26.5719	26.4135	25.6696	25.5304	24.8824	24.8824	24.7624	25.1320	25.5304	25.8120	26.1064	(38)
Heat transfer coeff	53.6909	53.5293	53.3709	52.6270	52.4878	51.8398	51.8398	51.7198	52.0894	52.4878	52.7694	53.0638	(39)
Average = Sum(39)m / 12 =												52.6263	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9419	0.9391	0.9363	0.9233	0.9208	0.9095	0.9095	0.9074	0.9138	0.9208	0.9258	0.9309	(40)
HLP (average)												0.9233	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8957 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
56.0037	55.1621	53.9357	51.5892	49.8575	47.9263	46.8287	48.0458	49.3800	51.4535	53.8504	55.7892	(42a)

Hot water usage for baths

24.2067	23.8472	23.3409	22.4075	21.7085	20.9335	20.5149	21.0176	21.5649	22.3942	23.3469	24.1248	(42b)

Hot water usage for other uses

	34.0436	32.8056	31.5677	30.3297	29.0918	27.8538	27.8538	29.0918	30.3297	31.5677	32.8056	34.0436 (42c)

Average daily hot water use (litres/day) 105.0257 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	114.2540	111.8149	108.8443	104.3263	100.6578	96.7136	95.1973	98.1551	101.2747	105.4154	110.0029	113.9576	(44)
Energy conte	180.9503	159.2229	167.2896	142.8176	135.5047	118.9207	115.1329	121.5366	124.8818	143.0477	156.7193	178.4300	(45)
Energy content (annual)										Total = Sum(45)m =		1744.4541	
Distribution loss (46)m = 0.15 x (45)m													
	27.1426	23.8834	25.0934	21.4226	20.3257	17.8381	17.2699	18.2305	18.7323	21.4572	23.5079	26.7645	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	227.5452	201.3086	213.8845	187.9094	182.0996	164.0126	161.7278	168.1315	169.9736	189.6426	201.8112	225.0249	(62)
WWHRS	-25.6026	-22.6431	-23.7106	-19.6333	-18.2975	-15.6573	-14.6762	-15.6067	-16.1997	-19.0976	-21.6353	-25.1284	(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													
	201.9427	178.6655	190.1739	168.2761	163.8021	148.3552	147.0516	152.5248	153.7740	170.5450	180.1759	199.8964	(64)
										Total per year (kWh/year) = Sum(64)m =		2055.1832	(64)
12Total per year (kWh/year)												2055	(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													
	97.4419	86.6102	92.8997	83.5603	82.3312	75.6146	75.5576	77.6868	77.5967	84.8393	88.1827	96.6039	(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	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	94.7836	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	84.9863	94.0920	84.9863	87.8192	84.9863	87.8192	84.9863	84.9863	87.8192	84.9863	87.8192	84.9863	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	165.3227	167.0382	162.7151	153.5118	141.8942	130.9753	123.6809	121.9653	126.2884	135.4918	147.1093	158.0282	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	32.4784	(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)													
	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	-75.8269	(71)
Water heating gains (Table 5)													
	130.9703	128.8842	124.8652	116.0560	110.6603	105.0203	101.5559	104.4178	107.7731	114.0313	122.4759	129.8439	(72)
Total internal gains													
	435.7144	444.4495	427.0017	411.8221	391.9759	375.2499	361.6582	362.8045	373.3159	388.9445	411.8395	427.2936	(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	3.0000	10.6334	0.6300	0.7000	0.7700	9.7491	(74)
East	2.0000	19.6403	0.6300	0.7000	0.7700	12.0046	(76)
South	5.4000	46.7521	0.6300	0.7000	0.7700	77.1554	(78)

Solar gains	98.9092	168.4753	231.2940	289.1770	327.2004	326.5338	314.0878	285.2962	251.1866	186.3350	118.4506	84.6687	(83)
Total gains	534.6236	612.9249	658.2957	700.9990	719.1763	701.7837	675.7461	648.1008	624.5024	575.2794	530.2902	511.9623	(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	72.3482	72.5666	72.7820	73.8109	74.0067	74.9318	74.9318	75.1056	74.5727	74.0067	73.6117	73.2034	
alpha	5.8232	5.8378	5.8521	5.9207	5.9338	5.9955	5.9955	6.0070	5.9715	5.9338	5.9074	5.8802	
util living area													
	0.9795	0.9562	0.9135	0.8114	0.6553	0.4700	0.3372	0.3665	0.5663	0.8324	0.9544	0.9833	(86)
MIT	20.2596	20.4524	20.6571	20.8645	20.9664	20.9961	20.9996	20.9993	20.9885	20.8664	20.5472	20.2280	(87)
Th 2	20.1320	20.1344	20.1367	20.1478	20.1498	20.1595	20.1595	20.1612	20.1557	20.1498	20.1456	20.1413	(88)
util rest of house													
	0.9740	0.9453	0.8933	0.7744	0.6028	0.4095	0.2730	0.3000	0.5008	0.7908	0.9411	0.9787	(89)

MIT 2	19.2931	19.5327	19.7803	20.0223	20.1242	20.1574	20.1593	20.1610	20.1489	20.0314	19.6618	19.2610 (90)
Living area fraction										fLA = Living area / (4) =		0.4912 (91)
MIT	19.7679	19.9845	20.2110	20.4360	20.5379	20.5694	20.5721	20.5728	20.5614	20.4416	20.0967	19.7360 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7679	19.9845	20.2110	20.4360	20.5379	20.5694	20.5721	20.5728	20.5614	20.4416	20.0967	19.7360 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9712	0.9432	0.8952	0.7875	0.6272	0.4391	0.3045	0.3327	0.5327	0.8059	0.9403	0.9761	(94)
Useful gains	519.2073	578.0954	589.2935	552.0477	451.0604	308.1694	205.7955	215.6202	332.6449	463.6446	498.6114	499.7178	(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	830.4842	807.4619	731.7703	607.1067	463.8818	309.4499	205.9108	215.8150	336.5676	516.5631	685.8295	824.3998	(97)
Space heating kWh	231.5900	154.1343	106.0027	39.6425	9.5392	0.0000	0.0000	0.0000	0.0000	39.3714	134.7970	241.5634	(98a)
Space heating requirement - total per year (kWh/year)												956.6405	
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	231.5900	154.1343	106.0027	39.6425	9.5392	0.0000	0.0000	0.0000	0.0000	39.3714	134.7970	241.5634	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												956.6405	
Space heating per m2											(98c) / (4) =	16.7832	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	231.5900	154.1343	106.0027	39.6425	9.5392	0.0000	0.0000	0.0000	0.0000	39.3714	134.7970	241.5634	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	250.9101	166.9928	114.8459	42.9496	10.3349	0.0000	0.0000	0.0000	0.0000	42.6559	146.0423	261.7155	(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	201.9427	178.6655	190.1739	168.2761	163.8021	148.3552	147.0516	152.5248	153.7740	170.5450	180.1759	199.8964	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3678	83.7303	82.8036	81.3724	80.2476	79.8000	79.8000	79.8000	79.8000	81.3463	83.4182	84.4855	(217)
Fuel for water heating, kWh/month	239.3600	213.3821	229.6686	206.7974	204.1209	185.9088	184.2752	191.1338	192.6992	209.6529	215.9910	236.6046	(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	17.6585	14.1663	12.7552	9.3450	7.2183	5.8974	6.5848	8.5592	11.1175	14.5868	16.4758	18.1493	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.5424	-28.5213	-42.4326	-49.4512	-54.8572	-51.7870	-51.1763	-47.5669	-41.4381	-33.4072	-21.8349	-16.7859	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.2773	-17.6686	-35.5888	-54.1374	-72.2404	-72.8023	-71.9225	-60.5769	-43.9970	-25.4676	-11.1179	-6.5248	(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	1036.4470	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2509.5945	(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)	142.5141	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-939.1226	(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	2835.4329 (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	1036.4470	0.2100	217.6539	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2509.5945	0.2100	527.0148	(264)
Space and water heating			744.6687	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	142.5141	0.1443	20.5692	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-458.8009	0.1338	-61.4082	
PV Unit electricity exported	-480.3217	0.1255	-60.2956	
Total			-121.7037	(269)
Total CO2, kg/year			655.4634	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5000	(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	1036.4470	1.1300	1171.1851	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2509.5945	1.1300	2835.8418	(278)
Space and water heating			4007.0268	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	142.5141	1.5338	218.5928	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-458.8009	1.4946	-685.7358	
PV Unit electricity exported	-480.3217	0.4608	-221.3182	
Total			-907.0541	(283)
Total Primary energy kWh/year			3448.6664	(286)
Target Primary Energy Rate (TPER)			60.5000	(287)

Full SAP Calculation Printout

Property Reference	House Type A	Issued on Date	05/10/2023
Assessment Reference	Plot 34	Prop Type Ref	
Property			

SAP Rating	82 B	DER	4.14	TER	9.84
Environmental	96 A	% DER < TER			57.93
CO_2 Emissions (t/year)	0.39	DFEE	28.02	TFEE	28.70
Compliance Check	See BREL	% DFEE < TFEE			2.38
% DPER < TPER	15.26	DPER	43.73	TPER	51.61

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	101.0000	(1b)	x 2.4000	(2b) =	242.4000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	101.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		242.4000	(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	1 * 10 =	10.0000 (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) =	10.0000 / (5) =	0.0413 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2413 (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) =	0.2051 (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	0.2615	0.2563	0.2512	0.2256	0.2204	0.1948	0.1948	0.1897	0.2051	0.2204	0.2307	0.2410	(22b)
Effective ac	0.5342	0.5329	0.5316	0.5254	0.5243	0.5190	0.5190	0.5180	0.5210	0.5243	0.5266	0.5290	(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	
Opening Type 1 (Uw = 1.20)			7.6000	1.1450	8.7023			(27)
External Wall 1	100.0000	7.6000	92.4000	0.1900	17.5560	190.0000	17556.0000	(29a)
External Roof 1	101.0000		101.0000	0.1500	15.1500	9.0000	909.0000	(30)
Total net area of external elements Aum(A, m2)			201.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.4083			(33)
Party Floor 1			101.0000			40.0000	4040.0000	(32d)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		22505.0000	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 222.8218 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	9.6000	0.0410	0.3936
E2 Other lintels (including other steel lintels)	8.5000	0.0240	0.2040
E3 Sill	5.2000	0.0190	0.0988
E4 Jamb	24.0800	0.0140	0.3371
E18 Party wall between dwellings	4.8000	0.0400	0.1920
E11 Eaves (insulation at rafter level)	45.0000	0.0110	0.4950

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 1.7205 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 43.1288 (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	42.7302	42.6240	42.5199	42.0311	41.9397	41.5139	41.5139	41.4351	41.6779	41.9397	42.1247	42.3181	(38)
Heat transfer coeff	85.8590	85.7528	85.6487	85.1599	85.0685	84.6427	84.6427	84.5639	84.8067	85.0685	85.2535	85.4469	(39)

Average = Sum(39)m / 12 = 85.1595

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8501	0.8490	0.8480	0.8432	0.8423	0.8380	0.8380	0.8373	0.8397	0.8423	0.8441	0.8460	(40)
HLP (average)												0.8432	
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 2.7486 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
70.3046	69.2481	67.7085	64.7628	62.5889	60.1646	58.7867	60.3146	61.9895	64.5925	67.6015	70.0353	(42a)

Hot water usage for baths

30.3565	29.9057	29.2708	28.1002	27.2237	26.2518	25.7268	26.3572	27.0436	28.0836	29.2783	30.2539	(42b)

Hot water usage for other uses

42.7783	41.2228	39.6672	38.1116	36.5560	35.0005	35.0005	36.5560	38.1116	39.6672	41.2228	42.7783	(42c)

Average daily hot water use (litres/day) 131.8532 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.4395	140.3765	136.6465	130.9746	126.3686	121.4169	119.5139	123.2279	127.1448	132.3433	138.1025	143.0675	(44)
Energy conte	227.1731	199.8943	210.0206	179.2977	170.1165	149.2962	144.5417	152.5818	156.7822	179.5886	196.7524	224.0091	(45)

Energy content (annual) Total = Sum(45)m = 2190.0542

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

34.0760	29.9841	31.5031	26.8947	25.5175	22.3944	21.6813	22.8873	23.5173	26.9383	29.5129	33.6014	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9720 (55)

Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

280.5675	248.1215	263.4150	230.9697	223.5109	200.9682	197.9361	205.9762	208.4542	232.9830	248.4244	277.4035	(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

280.5675	248.1215	263.4150	230.9697	223.5109	200.9682	197.9361	205.9762	208.4542	232.9830	248.4244	277.4035	(64)

Total per year (kWh/year) = Sum(64)m = 2818.7302 (64)

12Total per year (kWh/year) 2819 (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

118.2506	105.0466	112.5474	100.9541	99.2792	90.9786	90.7756	93.4490	93.4677	102.4287	106.7578	117.1986	(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	137.4296	137.4296	137.4296	137.4296	137.4296	137.4296	137.4296	137.4296	137.4296	137.4296	137.4296	137.4296	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	158.8059	175.8208	158.8059	164.0994	158.8059	164.0994	158.8059	158.8059	164.0994	158.8059	164.0994	158.8059	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.9343	260.6109	253.8661	239.5071	221.3816	204.3461	192.9653	190.2888	197.0336	211.3925	229.5181	246.5536	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7430	36.7430	36.7430	36.7430	36.7430	36.7430	36.7430	36.7430	36.7430	36.7430	36.7430	36.7430	(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)	-109.9437	-109.9437	-109.9437	-109.9437	-109.9437	-109.9437	-109.9437	-109.9437	-109.9437	-109.9437	-109.9437	-109.9437	(71)
Water heating gains (Table 5)	158.9389	156.3194	151.2733	140.2140	133.4399	126.3591	122.0103	125.6035	129.8162	137.6730	148.2747	157.5249	(72)
Total internal gains	639.9081	656.9800	628.1742	608.0495	577.8562	559.0335	538.0104	538.9270	555.1782	572.1003	606.1211	627.1133	(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	3.0000	10.6334	0.7600	0.7000	0.7700	11.7608	(74)
South	3.0000	46.7521	0.7600	0.7000	0.7700	51.7091	(78)
West	1.6000	19.6403	0.7600	0.7000	0.7700	11.5854	(80)

Solar gains	75.0554	129.8253	183.3903	237.7019	276.3996	279.0259	267.0743	237.3919	202.0158	144.9884	90.2471	64.0131	(83)
Total gains	714.9634	786.8053	811.5645	845.7514	854.2558	838.0595	805.0847	776.3190	757.1939	717.0887	696.3682	691.1264	(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	72.8100	72.9001	72.9887	73.4076	73.4866	73.8562	73.8562	73.9250	73.7134	73.4866	73.3271	73.1611	
alpha	5.8540	5.8600	5.8659	5.8938	5.8991	5.9237	5.9237	5.9283	5.9142	5.8991	5.8885	5.8774	
util living area													
	0.9914	0.9837	0.9698	0.9248	0.8203	0.6283	0.4600	0.4969	0.7268	0.9283	0.9815	0.9929	(86)
Living	20.1046	20.2507	20.4380	20.6929	20.8882	20.9812	20.9974	20.9960	20.9569	20.7290	20.3798	20.0739	
Non living	19.1661	19.3514	19.5873	19.9007	20.1195	20.2088	20.2195	20.2195	20.1891	19.9484	19.5194	19.1297	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5420	20.2507	20.4380	20.6929	20.8882	20.9812	20.9974	20.9960	20.9569	20.7290	20.3798	20.2034	(87)
Th 2	20.2101	20.2110	20.2119	20.2161	20.2169	20.2205	20.2205	20.2212	20.2191	20.2169	20.2153	20.2136	(88)
util rest of house													
	0.9891	0.9794	0.9616	0.9044	0.7763	0.5589	0.3799	0.4149	0.6604	0.9050	0.9759	0.9910	(89)
MIT 2	19.7939	19.3514	19.5873	19.9007	20.1195	20.2088	20.2195	20.2195	20.1891	19.9484	19.5194	19.3250	(90)
Living area fraction										fLA = Living area / (4) =		0.3267	(91)
MIT	20.0383	19.6452	19.8653	20.1595	20.3707	20.4612	20.4737	20.4732	20.4400	20.2034	19.8006	19.6120	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0383	19.6452	19.8653	20.1595	20.3707	20.4612	20.4737	20.4732	20.4400	20.2034	19.8006	19.6120	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9885	0.9756	0.9573	0.9028	0.7856	0.5809	0.4061	0.4417	0.6801	0.9045	0.9721	0.9891	(94)
Useful gains	706.7527	767.6270	776.8867	763.5354	671.0848	486.7939	326.9260	342.8897	514.9667	648.6135	676.9674	683.6112	(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													
	1351.2754	1264.4460	1144.7169	958.8601	737.6001	496.1072	327.8775	344.4448	537.6737	816.9498	1082.7662	1316.9094	(97)
Space heating kWh													
	479.5249	333.8624	273.6657	140.6338	49.4874	0.0000	0.0000	0.0000	0.0000	125.2422	292.1752	471.1739	(98a)
Space heating requirement - total per year (kWh/year)												2165.7655	
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													
	479.5249	333.8624	273.6657	140.6338	49.4874	0.0000	0.0000	0.0000	0.0000	125.2422	292.1752	471.1739	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2165.7655	
Space heating per m2											(98c) / (4) =	21.4432	(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 %)	253.0958	(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													
	479.5249	333.8624	273.6657	140.6338	49.4874	0.0000	0.0000	0.0000	0.0000	125.2422	292.1752	471.1739	(98)
Space heating efficiency (main heating system 1)													
	253.0958	253.0958	253.0958	253.0958	253.0958	0.0000	0.0000	0.0000	0.0000	253.0958	253.0958	253.0958	(210)
Space heating fuel (main heating system)													
	189.4638	131.9115	108.1273	55.5655	19.5528	0.0000	0.0000	0.0000	0.0000	49.4841	115.4406	186.1643	(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

	280.5675	248.1215	263.4150	230.9697	223.5109	200.9682	197.9361	205.9762	208.4542	232.9830	248.4244	277.4035 (64)
Efficiency of water heater												168.7400 (216)
(217)m	168.7400	168.7400	168.7400	168.7400	168.7400	168.7400	168.7400	168.7400	168.7400	168.7400	168.7400	168.7400 (217)
Fuel for water heating, kWh/month												
	166.2720	147.0437	156.1070	136.8790	132.4587	119.0993	117.3024	122.0672	123.5357	138.0721	147.2231	164.3970 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	42.4738	34.0741	30.6799	22.4774	17.3622	14.1851	15.8384	20.5873	26.7409	35.0855	39.6290	43.6543 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	855.7098 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	168.7400
Water heating fuel used	1670.4573 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	342.7882 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	2868.9554 (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	855.7098	0.1561	133.5649	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1670.4573	0.1409	235.4325	(264)
Space and water heating			368.9974	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	342.7882	0.1443	49.4749	(268)
Total CO2, kg/year			418.4724	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	855.7098	1.5778	1350.1779	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1670.4573	1.5211	2541.0048	(278)
Space and water heating			3891.1826	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	342.7882	1.5338	525.7800	(282)
Total Primary energy kWh/year			4416.9626	(286)
Dwelling Primary energy Rate (DPER)			43.7300	(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	101.0000 (1b)	x	2.4000 (2b)	=	242.4000 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	101.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	242.4000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1650	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4150	(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) =	0.3528	(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	0.4498	0.4410	0.4321	0.3880	0.3792	0.3351	0.3351	0.3263	0.3528	0.3792	0.3969	0.4145	(22b)
Effective ac	0.6011	0.5972	0.5934	0.5753	0.5719	0.5562	0.5562	0.5532	0.5622	0.5719	0.5787	0.5859	(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 Opening Type (Uw = 1.20)			7.6000	1.1450	8.7023			(27)
External Wall 1	100.0000	7.6000	92.4000	0.1800	16.6320			(29a)
External Roof 1	101.0000		101.0000	0.1100	11.1100			(30)
Total net area of external elements Aum(A, m2)			201.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.4443			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 222.8218 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	9.6000	0.0900	0.8640
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3 Sill	5.2000	0.0500	0.2600
E4 Jamb	24.0800	0.0500	1.2040
E18 Party wall between dwellings	4.8000	0.0600	0.2880
E11 Eaves (insulation at rafter level)	45.0000	0.0400	1.8000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		4.8410	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	41.2853	(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	48.0871	47.7729	47.4649	46.0184	45.7478	44.4879	44.4879	44.2546	44.9732	45.7478	46.2953	46.8676	(38)
Heat transfer coeff	89.3724	89.0582	88.7502	87.3037	87.0331	85.7732	85.7732	85.5399	86.2585	87.0331	87.5806	88.1529	(39)
Average = Sum(39)m / 12 =												87.3024	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8849	0.8818	0.8787	0.8644	0.8617	0.8492	0.8492	0.8469	0.8540	0.8617	0.8671	0.8728	(40)
HLP (average)												0.8644	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7486 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
70.3046	69.2481	67.7085	64.7628	62.5889	60.1646	58.7867	60.3146	61.9895	64.5925	67.6015	70.0353	(42a)

Hot water usage for baths

	30.3565	29.9057	29.2708	28.1002	27.2237	26.2518	25.7268	26.3572	27.0436	28.0836	29.2783	30.2539 (42b)
Hot water usage for other uses												
	42.7783	41.2228	39.6672	38.1116	36.5560	35.0005	35.0005	36.5560	38.1116	39.6672	41.2228	42.7783 (42c)
Average daily hot water use (litres/day)												131.8532 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	143.4395	140.3765	136.6465	130.9746	126.3686	121.4169	119.5139	123.2279	127.1448	132.3433	138.1025	143.0675	(44)
Energy conte	227.1731	199.8943	210.0206	179.2977	170.1165	149.2962	144.5417	152.5818	156.7822	179.5886	196.7524	224.0091	(45)
Energy content (annual)										Total = Sum(45)m =		2190.0542	
Distribution loss (46)m = 0.15 x (45)m													
	34.0760	29.9841	31.5031	26.8947	25.5175	22.3944	21.6813	22.8873	23.5173	26.9383	29.5129	33.6014	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	273.7680	241.9800	256.6155	224.3895	216.7114	194.3880	191.1366	199.1767	201.8740	226.1835	241.8442	270.6040	(62)
WWHRS	-32.1403	-28.4252	-29.7652	-24.6468	-22.9699	-19.6555	-18.4239	-19.5920	-20.3364	-23.9743	-27.1600	-31.5452	(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													
	241.6277	213.5549	226.8503	199.7428	193.7415	174.7325	172.7127	179.5847	181.5377	202.2091	214.6842	239.0589	(64)
										Total per year (kWh/year) = Sum(64)m =		2440.0369	(64)
12Total per year (kWh/year)												2440	(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													
	112.8110	100.1334	107.1078	95.6900	93.8397	85.7145	85.3360	88.0094	88.2036	96.9891	101.4936	111.7590	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	137.4296	137.4296	137.4296	137.4296	137.4296	137.4296	137.4296	137.4296	137.4296	137.4296	137.4296	137.4296	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	158.8059	175.8208	158.8059	164.0994	158.8059	164.0994	158.8059	158.8059	164.0994	158.8059	164.0994	158.8059	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	257.9343	260.6109	253.8661	239.5071	221.3816	204.3461	192.9653	190.2888	197.0336	211.3925	229.5181	246.5536	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.7430	36.7430	36.7430	36.7430	36.7430	36.7430	36.7430	36.7430	36.7430	36.7430	36.7430	36.7430	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-109.9437	-109.9437	-109.9437	-109.9437	-109.9437	-109.9437	-109.9437	-109.9437	-109.9437	-109.9437	-109.9437	-109.9437	(71)
Water heating gains (Table 5)													
	151.6277	149.0081	143.9621	132.9027	126.1286	119.0479	114.6990	118.2922	122.5049	130.3617	140.9634	150.2137	(72)
Total internal gains													
	635.5968	652.6687	623.8629	603.7382	573.5449	551.7223	530.6991	531.6158	547.8669	567.7890	601.8098	622.8020	(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	3.0000	10.6334	0.6300	0.7000	0.7700	9.7491	(74)
South	3.0000	46.7521	0.6300	0.7000	0.7700	42.8641	(78)
West	1.6000	19.6403	0.6300	0.7000	0.7700	9.6037	(80)

Solar gains	62.2169	107.6183	152.0209	197.0424	229.1207	231.2978	221.3905	196.7854	167.4605	120.1878	74.8101	53.0635	(83)
Total gains	697.8137	760.2870	775.8838	800.7806	802.6656	783.0201	752.0897	728.4012	715.3273	687.9768	676.6199	675.8655	(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	69.9477	70.1944	70.4380	71.6051	71.8277	72.8828	72.8828	73.0815	72.4727	71.8277	71.3787	70.9153	
alpha	5.6632	5.6796	5.6959	5.7737	5.7885	5.8589	5.8589	5.8721	5.8315	5.7885	5.7586	5.7277	
util living area													
	0.9928	0.9870	0.9770	0.9423	0.8562	0.6724	0.4974	0.5334	0.7652	0.9420	0.9846	0.9939	(86)
MIT	20.0196	20.1616	20.3508	20.6284	20.8495	20.9723	20.9959	20.9939	20.9410	20.6833	20.3218	20.0054	(87)
Th 2	20.1804	20.1830	20.1856	20.1979	20.2002	20.2109	20.2109	20.2128	20.2067	20.2002	20.1955	20.1907	(88)
util rest of house													

	0.9908	0.9835	0.9704	0.9253	0.8158	0.6004	0.4105	0.4455	0.6992	0.9217	0.9798	0.9922 (89)
MIT 2	19.0354	19.2176	19.4584	19.8102	20.0658	20.1933	20.2093	20.2103	20.1646	19.8818	19.4314	19.0252 (90)
Living area fraction										fLA = Living area / (4) =		0.3267 (91)
MIT	19.3569	19.5260	19.7500	20.0776	20.3219	20.4478	20.4663	20.4663	20.4183	20.1437	19.7223	19.3455 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3569	19.5260	19.7500	20.0776	20.3219	20.4478	20.4663	20.4663	20.4183	20.1437	19.7223	19.3455 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9882	0.9799	0.9661	0.9224	0.8225	0.6228	0.4389	0.4743	0.7179	0.9200	0.9762	0.9899	(94)
Useful gains	689.5602	744.9954	749.5437	738.6176	660.1971	487.6636	330.0877	345.4489	513.5201	632.9711	660.4989	669.0354	(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													
	1345.6746	1302.5676	1175.9402	975.8415	750.3883	501.5838	331.6228	347.8323	545.0053	830.6141	1105.4676	1335.1170	(97)
Space heating kWh													
	488.1491	374.6885	317.2390	170.8013	67.1023	0.0000	0.0000	0.0000	0.0000	147.0464	320.3775	495.5647	(98a)
Space heating requirement - total per year (kWh/year)												2380.9686	
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													
	488.1491	374.6885	317.2390	170.8013	67.1023	0.0000	0.0000	0.0000	0.0000	147.0464	320.3775	495.5647	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2380.9686	
Space heating per m2											(98c) / (4) =	23.5739	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	488.1491	374.6885	317.2390	170.8013	67.1023	0.0000	0.0000	0.0000	0.0000	147.0464	320.3775	495.5647	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	528.8723	405.9464	343.7042	185.0501	72.7002	0.0000	0.0000	0.0000	0.0000	159.3135	347.1045	536.9065	(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													
	241.6277	213.5549	226.8503	199.7428	193.7415	174.7325	172.7127	179.5847	181.5377	202.2091	214.6842	239.0589	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6034	85.3072	84.8119	83.7108	81.9363	79.8000	79.8000	79.8000	79.8000	83.3570	84.9556	85.6563	(217)
Fuel for water heating, kWh/month													
	282.2641	250.3364	267.4746	238.6106	236.4538	218.9631	216.4320	225.0435	227.4908	242.5821	252.7017	279.0908	(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	32.9967	26.4712	23.8344	17.4621	13.4882	11.0200	12.3044	15.9937	20.7743	27.2570	30.7867	33.9138	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.7086	-48.6923	-71.6548	-82.4992	-90.5674	-85.0751	-84.0323	-78.5755	-69.1606	-56.5800	-37.4760	-29.0079	(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	-15.5861	-33.1528	-66.5937	-101.0525	-134.6405	-135.6884	-134.0902	-113.0478	-82.2244	-47.7422	-20.9140	-12.2970	(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												2579.5977	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2937.4433	(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)												266.3025	(232)

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

PV generation	-1664.0593 (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	4205.2841 (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	2579.5977	0.2100	541.7155	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2937.4433	0.2100	616.8631	(264)
Space and water heating			1158.5786	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	266.3025	0.1443	38.4357	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-767.0297	0.1341	-102.8574	
PV Unit electricity exported	-897.0296	0.1256	-112.6603	
Total			-215.5177	(269)
Total CO2, kg/year			993.4258	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.8400	(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	2579.5977	1.1300	2914.9454	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2937.4433	1.1300	3319.3109	(278)
Space and water heating			6234.2563	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	266.3025	1.5338	408.4637	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-767.0297	1.4956	-1147.1525	
PV Unit electricity exported	-897.0296	0.4610	-413.5274	
Total			-1560.6799	(283)
Total Primary energy kWh/year			5212.1409	(286)
Target Primary Energy Rate (TPER)			51.6100	(287)

Full SAP Calculation Printout

Property Reference	House Type E	Issued on Date	05/10/2023
Assessment Reference	Plot 35	Prop Type Ref	
Property			

SAP Rating	82 B	DER	4.09	TER	9.05
Environmental	96 A	% DER < TER			54.81
CO_2 Emissions (t/year)	0.38	DFEE	26.87	TFEE	30.18
Compliance Check	See BREL	% DFEE < TFEE			10.97
% DPER < TPER	8.25	DPER	43.21	TPER	47.09

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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		50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
First floor		50.0000 (1c)	x	2.4000 (2c)	=	120.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.0000	(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		1 * 10 =	10.0000	(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) =		10.0000 / (5) =	0.0417	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			4.0000	(17)
Infiltration rate			0.2417	(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) =	0.2054	(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	0.2619	0.2568	0.2516	0.2260	0.2208	0.1951	0.1951	0.1900	0.2054	0.2208	0.2311	0.2414	(22b)
Effective ac	0.5343	0.5330	0.5317	0.5255	0.5244	0.5190	0.5190	0.5181	0.5211	0.5244	0.5267	0.5291	(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	
Opening Type 1 (Uw = 1.20)			10.6000	1.1450	12.1374			(27)
Heatloss Floor 1			50.0000	0.1200	6.0000	110.0000	5500.0000	(28a)
External Wall 1	100.0000	10.6000	89.4000	0.1900	16.9860	190.0000	16986.0000	(29a)
External Roof 1	50.0000		50.0000	0.1500	7.5000	9.0000	450.0000	(30)
Total net area of external elements Aum(A, m2)			200.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.6234			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 22936.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 229.3600 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E5	Ground floor (normal)	21.0000	0.0670	1.4070
E6	Intermediate floor within a dwelling	21.0000	0.0020	0.0420
E16	Corner (normal)	9.6000	0.0410	0.3936
E18	Party wall between dwellings	9.6000	0.0420	0.4032
E2	Other lintels (including other steel lintels)	14.0500	0.0240	0.3372
E3	Sill	10.8000	0.0190	0.2052
E4	Jamb	32.9000	0.0140	0.4606
E10	Eaves (insulation at ceiling level)	11.0000	0.0460	0.5060
E12	Gable (insulation at ceiling level)	10.0000	0.0330	0.3300

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.0848 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.7082 (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	42.3164	42.2109	42.1075	41.6219	41.5310	41.1080	41.1080	41.0297	41.2710	41.5310	41.7148	41.9070	(38)
Heat transfer coeff	89.0246	88.9191	88.8157	88.3301	88.2392	87.8162	87.8162	87.7379	87.9792	88.2392	88.4230	88.6152	(39)

Average = Sum(39)m / 12 = 88.3296

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8902	0.8892	0.8882	0.8833	0.8824	0.8782	0.8782	0.8774	0.8798	0.8824	0.8842	0.8862	(40)
HLP (average)												0.8833	
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 2.7395 (42)
Hot water usage for mixer showers

70.1526	69.0984	67.5621	64.6228	62.4536	60.0345	58.6596	60.1842	61.8555	64.4528	67.4553	69.8838	(42a)

Hot water usage for baths

30.2911	29.8413	29.2078	28.0397	27.1651	26.1952	25.6714	26.3005	26.9854	28.0232	29.2153	30.1887	(42b)

Hot water usage for other uses

42.6855	41.1333	39.5811	38.0289	36.4767	34.9245	34.9245	36.4767	38.0289	39.5811	41.1333	42.6855	(42c)

Average daily hot water use (litres/day) 131.5680 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.1293	140.0729	136.3510	130.6913	126.0953	121.1543	119.2554	122.9613	126.8698	132.0570	137.8038	142.7581	(44)
Energy conte	226.6818	199.4620	209.5664	178.9099	169.7486	148.9733	144.2291	152.2518	156.4431	179.2001	196.3268	223.5246	(45)
Energy content (annual)										Total = Sum(45)m =		2185.3176	
Distribution loss (46)m = 0.15 x (45)m	34.0023	29.9193	31.4350	26.8365	25.4623	22.3460	21.6344	22.8378	23.4665	26.8800	29.4490	33.5287	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

280.0762	247.6892	262.9608	230.5819	223.1430	200.6453	197.6235	205.6462	208.1151	232.5945	247.9988	276.9190	(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

280.0762	247.6892	262.9608	230.5819	223.1430	200.6453	197.6235	205.6462	208.1151	232.5945	247.9988	276.9190	(64)

Total per year (kWh/year) = Sum(64)m = 2813.9936 (64)
12Total per year (kWh/year) 2814 (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

118.0872	104.9029	112.3963	100.8251	99.1569	90.8712	90.6717	93.3392	93.3549	102.2996	106.6163	117.0375	(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	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.4525	163.2510	147.4525	152.3676	147.4525	152.3676	147.4525	147.4525	152.3676	147.4525	152.3676	147.4525	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	256.3278	258.9876	252.2848	238.0153	220.0027	203.0733	191.7634	189.1036	195.8064	210.0759	228.0885	245.0179	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	(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)	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	(71)

Water heating gains (Table 5)

	158.7194	156.1055	151.0703	140.0349	133.2754	126.2100	121.8706	125.4560	129.6596	137.4994	148.0782	157.3084 (72)

Total internal gains

	626.5925	642.4370	614.9006	594.5108	564.8235	545.7438	525.1794	526.1049	541.9265	559.1207	592.6272	613.8717 (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
East	5.9000	19.6403	0.7600	0.7000	0.7700	42.7213 (76)
South	4.7000	46.7521	0.7600	0.7000	0.7700	81.0109 (78)

Solar gains	123.7322	216.2469	306.6354	391.7382	445.0439	443.3773	426.9060	387.6966	336.6156	242.2675	149.2940	105.1328 (83)
Total gains	750.3247	858.6839	921.5360	986.2490	1009.8674	989.1212	952.0854	913.8016	878.5421	801.3882	741.9211	719.0045 (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	71.5658	71.6507	71.7341	72.1285	72.2027	72.5505	72.5505	72.6153	72.4161	72.2027	72.0526	71.8964	
alpha	5.7711	5.7767	5.7823	5.8086	5.8135	5.8367	5.8367	5.8410	5.8277	5.8135	5.8035	5.7931	
util living area													
	0.9903	0.9784	0.9542	0.8851	0.7524	0.5590	0.4046	0.4396	0.6641	0.9044	0.9781	0.9923	(86)
Living	20.1017	20.2854	20.5063	20.7631	20.9264	20.9889	20.9986	20.9977	20.9714	20.7666	20.3912	20.0627	
Non living	19.1338	19.3657	19.6404	19.9476	20.1219	20.1796	20.1856	20.1859	20.1660	19.9585	19.5043	19.0871	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5405	20.2854	20.5063	20.7631	20.9264	20.9889	20.9986	20.9977	20.9714	20.7666	20.3912	20.1938	(87)
Th 2	20.1758	20.1767	20.1776	20.1817	20.1825	20.1861	20.1861	20.1868	20.1847	20.1825	20.1809	20.1793	(88)
util rest of house													
	0.9877	0.9728	0.9423	0.8575	0.7025	0.4917	0.3304	0.3630	0.5956	0.8751	0.9714	0.9902	(89)
MIT 2	19.7604	19.3657	19.6404	19.9476	20.1219	20.1796	20.1856	20.1859	20.1660	19.9585	19.5043	19.2839	(90)
Living area fraction											fLA = Living area / (4) =	0.2500	(91)
MIT	19.9554	19.5957	19.8568	20.1515	20.3230	20.3820	20.3888	20.3888	20.3673	20.1605	19.7260	19.5114	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9554	19.5957	19.8568	20.1515	20.3230	20.3820	20.3888	20.3888	20.3673	20.1605	19.7260	19.5114	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9868	0.9678	0.9368	0.8564	0.7115	0.5082	0.3490	0.3821	0.6115	0.8742	0.9666	0.9880	(94)
Useful gains	740.4578	831.0412	863.2805	844.6029	718.5555	502.6548	332.2524	349.1767	537.2051	700.5831	717.1568	710.3533	(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													
	1393.7158	1306.7240	1186.2977	993.8456	760.8890	507.7499	332.7208	349.9716	551.3931	843.6147	1116.4300	1356.8198	(97)
Space heating kWh													
	486.0239	319.6588	240.3248	107.4548	31.4961	0.0000	0.0000	0.0000	0.0000	106.4155	287.4766	480.9710	(98a)
Space heating requirement - total per year (kWh/year)												2059.8216	
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													
	486.0239	319.6588	240.3248	107.4548	31.4961	0.0000	0.0000	0.0000	0.0000	106.4155	287.4766	480.9710	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2059.8216	
Space heating per m2											(98c) / (4) =	20.5982	(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 %)	253.3850 (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													
	486.0239	319.6588	240.3248	107.4548	31.4961	0.0000	0.0000	0.0000	0.0000	106.4155	287.4766	480.9710	(98)
Space heating efficiency (main heating system 1)													
	253.3850	253.3850	253.3850	253.3850	253.3850	0.0000	0.0000	0.0000	0.0000	253.3850	253.3850	253.3850	(210)
Space heating fuel (main heating system)													
	191.8124	126.1554	94.8457	42.4077	12.4301	0.0000	0.0000	0.0000	0.0000	41.9976	113.4545	189.8183	(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												
	280.0762	247.6892	262.9608	230.5819	223.1430	200.6453	197.6235	205.6462	208.1151	232.5945	247.9988	276.9190 (64)
Efficiency of water heater												167.9964 (216)
(217)m	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964 (217)
Fuel for water heating, kWh/month												
	166.7156	147.4372	156.5276	137.2541	132.8261	119.4343	117.6356	122.4111	123.8807	138.4521	147.6215	164.8363 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	39.4133	31.6188	28.4692	20.8578	16.1111	13.1629	14.6971	19.1039	24.8141	32.5574	36.7735	40.5087 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	812.9217 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	167.9964
Water heating fuel used	1675.0323 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	318.0878 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	2806.0418 (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	812.9217	0.1568	127.4504	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1675.0323	0.1409	236.0755	(264)
Space and water heating			363.5260	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	318.0878	0.1443	45.9099	(268)
Total CO2, kg/year			409.4359	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0900	(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	812.9217	1.5804	1284.7295	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1675.0323	1.5211	2547.9571	(278)
Space and water heating			3832.6866	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	318.0878	1.5338	487.8938	(282)
Total Primary energy kWh/year			4320.5804	(286)
Dwelling Primary energy Rate (DPER)			43.2100	(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	50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
First floor	50.0000 (1c)	x	2.4000 (2c)	=	120.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.0000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80	=	0.0000 (6a)
Number of open flues	0 * 20	=	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10	=	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20	=	0.0000 (6d)
Number of flues attached to other heater	0 * 35	=	0.0000 (6e)
Number of blocked chimneys	0 * 20	=	0.0000 (6f)
Number of intermittent extract fans	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)	=	0.1250 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3750 (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)	=	0.3187 (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	0.4064	0.3984	0.3905	0.3506	0.3427	0.3028	0.3028	0.2948	0.3187	0.3427	0.3586	0.3745	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5458	0.5458	0.5435	0.5508	0.5587	0.5643	0.5701	(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 Opening Type (Uw = 1.20)			10.6000	1.1450	12.1374			(27)
Heatloss Floor 1			50.0000	0.1300	6.5000			(28a)
External Wall 1	100.0000	10.6000	89.4000	0.1800	16.0920			(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000			(30)
Total net area of external elements Aum(A, m2)			200.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.2294			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 229.3600 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	21.0000	0.1600	3.3600
E6 Intermediate floor within a dwelling	21.0000	0.0000	0.0000
E16 Corner (normal)	9.6000	0.0900	0.8640
E18 Party wall between dwellings	9.6000	0.0600	0.5760
E2 Other lintels (including other steel lintels)	14.0500	0.0500	0.7025
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	32.9000	0.0500	1.6450
E10 Eaves (insulation at ceiling level)	11.0000	0.0600	0.6600
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9475 (36)
Point Thermal bridges	(36a)	=	0.0000
Total fabric heat loss	(33) + (36) + (36a)	=	49.1769 (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	46.1406	45.8866	45.6376	44.4683	44.2496	43.2311	43.2311	43.0425	43.6234	44.2496	44.6921	45.1548	(38)
Heat transfer coeff	95.3175	95.0635	94.8146	93.6452	93.4265	92.4080	92.4080	92.2194	92.8003	93.4265	93.8690	94.3317	(39)
Average = Sum(39)m / 12 =												93.6442	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9532	0.9506	0.9481	0.9365	0.9343	0.9241	0.9241	0.9222	0.9280	0.9343	0.9387	0.9433	(40)
HLP (average)												0.9364	
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 2.7395 (42)

Hot water usage for mixer showers

	70.1526	69.0984	67.5621	64.6228	62.4536	60.0345	58.6596	60.1842	61.8555	64.4528	67.4553	69.8838 (42a)

Hot water usage for baths

	30.2911	29.8413	29.2078	28.0397	27.1651	26.1952	25.6714	26.3005	26.9854	28.0232	29.2153	30.1887 (42b)

Hot water usage for other uses

	42.6855	41.1333	39.5811	38.0289	36.4767	34.9245	34.9245	36.4767	38.0289	39.5811	41.1333	42.6855 (42c)

Average daily hot water use (litres/day) 131.5680 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	143.1293	140.0729	136.3510	130.6913	126.0953	121.1543	119.2554	122.9613	126.8698	132.0570	137.8038	142.7581	(44)
Energy conte	226.6818	199.4620	209.5664	178.9099	169.7486	148.9733	144.2291	152.2518	156.4431	179.2001	196.3268	223.5246	(45)
Energy content (annual)										Total = Sum(45)m =		2185.3176	
Distribution loss (46)m = 0.15 x (45)m													
	34.0023	29.9193	31.4350	26.8365	25.4623	22.3460	21.6344	22.8378	23.4665	26.8800	29.4490	33.5287	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	273.2767	241.5477	256.1613	224.0018	216.3435	194.0651	190.8240	198.8467	201.5349	225.7950	241.4187	270.1195	(62)
WWHRS	-32.0709	-28.3637	-29.7009	-24.5935	-22.9202	-19.6130	-18.3841	-19.5496	-20.2924	-23.9225	-27.1013	-31.4769	(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													
	241.2058	213.1840	226.4604	199.4083	193.4232	174.4521	172.4399	179.2971	181.2426	201.8726	214.3174	238.6426	(64)
										Total per year (kWh/year) = Sum(64)m =		2435.9460	(64)
12Total per year (kWh/year)												2436	(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													
	112.6476	99.9897	106.9567	95.5610	93.7173	85.6071	85.2321	87.8997	88.0908	96.8600	101.3521	111.5979	(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	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	147.4525	163.2510	147.4525	152.3676	147.4525	152.3676	147.4525	147.4525	152.3676	147.4525	152.3676	147.4525	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	256.3278	258.9876	252.2848	238.0153	220.0027	203.0733	191.7634	189.1036	195.8064	210.0759	228.0885	245.0179	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	(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)													
	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	(71)
Water heating gains (Table 5)													
	151.4081	148.7942	143.7591	132.7236	125.9641	118.8987	114.5593	118.1447	122.3483	130.1881	140.7669	149.9971	(72)
Total internal gains													
	622.2812	638.1257	610.5893	590.1995	560.5122	538.4325	517.8681	518.7936	534.6152	554.8094	588.3159	609.5604	(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	
East	5.9000	19.6403	0.6300	0.7000	0.7700	35.4137	(76)
South	4.7000	46.7521	0.6300	0.7000	0.7700	67.1538	(78)

Solar gains	102.5675	179.2573	254.1846	324.7304	368.9180	367.5365	353.8826	321.3801	279.0366	200.8270	123.7568	87.1495	(83)
Total gains	724.8487	817.3830	864.7739	914.9299	929.4302	905.9690	871.7507	840.1738	813.6518	755.6364	712.0727	696.7100	(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	66.8410	67.0195	67.1955	68.0345	68.1939	68.9454	68.9454	69.0864	68.6540	68.1939	67.8723	67.5394

alpha	5.4561	5.4680	5.4797	5.5356	5.5463	5.5964	5.5964	5.6058	5.5769	5.5463	5.5248	5.5026	
util living area													
	0.9925	0.9846	0.9692	0.9217	0.8173	0.6306	0.4629	0.4994	0.7314	0.9317	0.9837	0.9939	(86)
MIT	19.9596	20.1341	20.3594	20.6532	20.8692	20.9759	20.9963	20.9945	20.9458	20.6796	20.2772	19.9337	(87)
Th 2	20.1225	20.1247	20.1268	20.1366	20.1385	20.1471	20.1471	20.1487	20.1438	20.1385	20.1347	20.1308	(88)
util rest of house													
	0.9904	0.9804	0.9604	0.8995	0.7699	0.5554	0.3750	0.4098	0.6599	0.9078	0.9784	0.9921	(89)
MIT 2	18.9132	19.1357	19.4199	19.7846	20.0266	20.1326	20.1458	20.1465	20.1069	19.8232	19.3261	18.8865	(90)
Living area fraction										fLA = Living area / (4) =		0.2500	(91)
MIT	19.1748	19.3853	19.6548	20.0018	20.2373	20.3434	20.3584	20.3585	20.3166	20.0373	19.5639	19.1483	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1748	19.3853	19.6548	20.0018	20.2373	20.3434	20.3584	20.3585	20.3166	20.0373	19.5639	19.1483	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9873	0.9757	0.9545	0.8956	0.7758	0.5733	0.3970	0.4322	0.6752	0.9044	0.9738	0.9894	(94)
Useful gains	715.6161	797.5239	825.4667	819.3734	721.0453	519.3791	346.0923	363.1136	549.3695	683.4213	693.4072	689.3531	(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													
	1417.8276	1377.0205	1247.2620	1039.6298	797.6075	530.7387	347.3065	365.0509	576.9063	881.6967	1169.9699	1410.0967	(97)
Space heating kWh													
	522.4453	389.4218	313.8157	158.5846	56.9623	0.0000	0.0000	0.0000	0.0000	147.5169	343.1251	536.2333	(98a)
Space heating requirement - total per year (kWh/year)												2468.1051	
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													
	522.4453	389.4218	313.8157	158.5846	56.9623	0.0000	0.0000	0.0000	0.0000	147.5169	343.1251	536.2333	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2468.1051	
Space heating per m2											(98c) / (4) =	24.6811	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	522.4453	389.4218	313.8157	158.5846	56.9623	0.0000	0.0000	0.0000	0.0000	147.5169	343.1251	536.2333	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	566.0296	421.9087	339.9954	171.8143	61.7143	0.0000	0.0000	0.0000	0.0000	159.8233	371.7498	580.9678	(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													
	241.2058	213.1840	226.4604	199.4083	193.4232	174.4521	172.4399	179.2971	181.2426	201.8726	214.3174	238.6426	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7455	85.3929	84.7916	83.5512	81.6834	79.8000	79.8000	79.8000	79.8000	83.3675	85.1096	85.8192	(217)
Fuel for water heating, kWh/month													
	281.3044	249.6507	267.0788	238.6660	236.7963	218.6117	216.0901	224.6831	227.1210	242.1479	251.8135	278.0762	(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	30.6377	24.5787	22.1304	16.2137	12.5239	10.2321	11.4247	14.8503	19.2891	25.3083	28.5857	31.4892	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.8440	-64.1351	-91.4528	-101.9369	-109.1268	-101.5301	-100.2579	-95.0489	-85.7174	-72.9317	-50.2198	-39.6919	(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	-27.3659	-57.4172	-113.8667	-170.6646	-225.3404	-226.3366	-223.6865	-189.5402	-139.1118	-82.0022	-36.4980	-21.6521	(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												2674.0033	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2932.0396	(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)	247.2639 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2471.3753 (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	3467.9316 (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	2674.0033	0.2100	561.5407	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2932.0396	0.2100	615.7283	(264)
Space and water heating			1177.2690	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	247.2639	0.1443	35.6878	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-957.8931	0.1348	-129.0951	
PV Unit electricity exported	-1513.4822	0.1260	-190.6306	
Total			-319.7256	(269)
Total CO2, kg/year			905.1605	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.0500	(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	2674.0033	1.1300	3021.6238	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2932.0396	1.1300	3313.2048	(278)
Space and water heating			6334.8286	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	247.2639	1.5338	379.2617	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-957.8931	1.4981	-1435.0167	
PV Unit electricity exported	-1513.4822	0.4623	-699.7488	
Total			-2134.7655	(283)
Total Primary energy kWh/year			4709.4256	(286)
Target Primary Energy Rate (TPER)			47.0900	(287)

Full SAP Calculation Printout

Property Reference	House Type E	Issued on Date	05/10/2023
Assessment Reference	Plot 36	Prop Type Ref	
Property			

SAP Rating	81 B	DER	4.27	TER	9.63
Environmental	96 A	% DER < TER			55.66
CO_2 Emissions (t/year)	0.39	DFEE	29.90	TFEE	32.87
Compliance Check	See BREL	% DFEE < TFEE			9.05
% DPER < TPER	10.31	DPER	45.03	TPER	50.21

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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		50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
First floor		50.0000 (1c)	x	2.4000 (2c)	=	120.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.0000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0417	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2417	(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) =	0.2054	(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	0.2619	0.2568	0.2516	0.2260	0.2208	0.1951	0.1951	0.1900	0.2054	0.2208	0.2311	0.2414	(22b)
Effective ac	0.5343	0.5330	0.5317	0.5255	0.5244	0.5190	0.5190	0.5181	0.5211	0.5244	0.5267	0.5291	(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	
Opening Type 1 (Uw = 1.20)			10.6000	1.1450	12.1374			(27)
Heatloss Floor 1			50.0000	0.1200	6.0000	110.0000	5500.0000	(28a)
External Wall 1	100.0000	10.6000	89.4000	0.1900	16.9860	190.0000	16986.0000	(29a)
External Roof 1	50.0000		50.0000	0.1500	7.5000	9.0000	450.0000	(30)
Total net area of external elements Aum(A, m2)			200.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.6234			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 22936.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 229.3600 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E5	Ground floor (normal)	21.0000	0.0670	1.4070
E6	Intermediate floor within a dwelling	21.0000	0.0020	0.0420
E16	Corner (normal)	9.6000	0.0410	0.3936
E18	Party wall between dwellings	9.6000	0.0420	0.4032
E2	Other lintels (including other steel lintels)	14.0500	0.0240	0.3372
E3	Sill	10.8000	0.0190	0.2052
E4	Jamb	32.9000	0.0140	0.4606
E10	Eaves (insulation at ceiling level)	11.0000	0.0460	0.5060
E12	Gable (insulation at ceiling level)	10.0000	0.0330	0.3300

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.0848 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.7082 (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	42.3164	42.2109	42.1075	41.6219	41.5310	41.1080	41.1080	41.0297	41.2710	41.5310	41.7148	41.9070	(38)
Heat transfer coeff	89.0246	88.9191	88.8157	88.3301	88.2392	87.8162	87.8162	87.7379	87.9792	88.2392	88.4230	88.6152	(39)

Average = Sum(39)m / 12 = 88.3296

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8902	0.8892	0.8882	0.8833	0.8824	0.8782	0.8782	0.8774	0.8798	0.8824	0.8842	0.8862	(40)
HLP (average)												0.8833	
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 2.7395 (42)
Hot water usage for mixer showers

70.1526	69.0984	67.5621	64.6228	62.4536	60.0345	58.6596	60.1842	61.8555	64.4528	67.4553	69.8838	(42a)

Hot water usage for baths

30.2911	29.8413	29.2078	28.0397	27.1651	26.1952	25.6714	26.3005	26.9854	28.0232	29.2153	30.1887	(42b)

Hot water usage for other uses

42.6855	41.1333	39.5811	38.0289	36.4767	34.9245	34.9245	36.4767	38.0289	39.5811	41.1333	42.6855	(42c)

Average daily hot water use (litres/day) 131.5680 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.1293	140.0729	136.3510	130.6913	126.0953	121.1543	119.2554	122.9613	126.8698	132.0570	137.8038	142.7581	(44)
Energy conte	226.6818	199.4620	209.5664	178.9099	169.7486	148.9733	144.2291	152.2518	156.4431	179.2001	196.3268	223.5246	(45)
Energy content (annual)										Total = Sum(45)m =		2185.3176	
Distribution loss (46)m = 0.15 x (45)m	34.0023	29.9193	31.4350	26.8365	25.4623	22.3460	21.6344	22.8378	23.4665	26.8800	29.4490	33.5287	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

280.0762	247.6892	262.9608	230.5819	223.1430	200.6453	197.6235	205.6462	208.1151	232.5945	247.9988	276.9190	(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

280.0762	247.6892	262.9608	230.5819	223.1430	200.6453	197.6235	205.6462	208.1151	232.5945	247.9988	276.9190	(64)

Total per year (kWh/year) = Sum(64)m = 2813.9936 (64)
12Total per year (kWh/year) 2814 (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

118.0872	104.9029	112.3963	100.8251	99.1569	90.8712	90.6717	93.3392	93.3549	102.2996	106.6163	117.0375	(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	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.4525	163.2510	147.4525	152.3676	147.4525	152.3676	147.4525	147.4525	152.3676	147.4525	152.3676	147.4525	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	256.3278	258.9876	252.2848	238.0153	220.0027	203.0733	191.7634	189.1036	195.8064	210.0759	228.0885	245.0179	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	(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)	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	(71)

Water heating gains (Table 5)

	158.7194	156.1055	151.0703	140.0349	133.2754	126.2100	121.8706	125.4560	129.6596	137.4994	148.0782	157.3084 (72)

Total internal gains

	626.5925	642.4370	614.9006	594.5108	564.8235	545.7438	525.1794	526.1049	541.9265	559.1207	592.6272	613.8717 (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	4.7000	10.6334	0.7600	0.7000	0.7700	18.4253 (74)
East	5.9000	19.6403	0.7600	0.7000	0.7700	42.7213 (76)

Solar gains	61.1466	118.7836	197.4642	296.8341	375.4636	390.4195	369.1433	308.5985	232.0095	141.0800	75.9984	50.4921 (83)
Total gains	687.7391	761.2206	812.3648	891.3449	940.2871	936.1634	894.3227	834.7034	773.9360	700.2007	668.6256	664.3639 (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	71.5658	71.6507	71.7341	72.1285	72.2027	72.5505	72.5505	72.6153	72.4161	72.2027	72.0526	71.8964	
alpha	5.7711	5.7767	5.7823	5.8086	5.8135	5.8367	5.8367	5.8410	5.8277	5.8135	5.8035	5.7931	
util living area													
	0.9937	0.9876	0.9731	0.9185	0.7895	0.5878	0.4302	0.4799	0.7336	0.9416	0.9865	0.9948	(86)
Living	20.0296	20.1787	20.3990	20.6974	20.9053	20.9857	20.9980	20.9964	20.9525	20.6874	20.3112	19.9992	
Non living	19.0425	19.2322	19.5100	19.8749	20.1027	20.1777	20.1854	20.1853	20.1522	19.8705	19.4049	19.0064	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5036	20.1787	20.3990	20.6974	20.9053	20.9857	20.9980	20.9964	20.9525	20.6874	20.3112	20.1392	(87)
Th 2	20.1758	20.1767	20.1776	20.1817	20.1825	20.1861	20.1861	20.1868	20.1847	20.1825	20.1809	20.1793	(88)
util rest of house													
	0.9919	0.9842	0.9654	0.8962	0.7414	0.5182	0.3516	0.3969	0.6646	0.9206	0.9820	0.9933	(89)
MIT 2	19.7240	19.2322	19.5100	19.8749	20.1027	20.1777	20.1854	20.1853	20.1522	19.8705	19.4049	19.2177	(90)
Living area fraction										fLA = Living area / (4) =		0.2500	(91)
MIT	19.9189	19.4688	19.7322	20.0805	20.3033	20.3797	20.3885	20.3881	20.3522	20.0747	19.6315	19.4481	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9189	19.4688	19.7322	20.0805	20.3033	20.3797	20.3885	20.3881	20.3522	20.0747	19.6315	19.4481	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9912	0.9803	0.9603	0.8931	0.7489	0.5351	0.3713	0.4177	0.6796	0.9173	0.9782	0.9916	(94)
Useful gains	681.7088	746.2611	780.0735	796.0464	704.2170	500.9264	332.0439	348.6372	525.9732	642.3268	654.0199	658.7928	(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													
	1390.4641	1295.4464	1175.2290	987.5763	759.1520	507.5489	332.6955	349.9068	550.0669	836.0442	1108.0699	1351.2121	(97)
Space heating kWh													
	527.3139	369.0525	293.9957	137.9016	40.8717	0.0000	0.0000	0.0000	0.0000	144.1257	326.9160	515.1600	(98a)
Space heating requirement - total per year (kWh/year)												2355.3371	
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													
	527.3139	369.0525	293.9957	137.9016	40.8717	0.0000	0.0000	0.0000	0.0000	144.1257	326.9160	515.1600	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2355.3371	
Space heating per m2											(98c) / (4) =	23.5534	(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 %)	253.3850 (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													
	527.3139	369.0525	293.9957	137.9016	40.8717	0.0000	0.0000	0.0000	0.0000	144.1257	326.9160	515.1600	(98)
Space heating efficiency (main heating system 1)													
	253.3850	253.3850	253.3850	253.3850	253.3850	0.0000	0.0000	0.0000	0.0000	253.3850	253.3850	253.3850	(210)
Space heating fuel (main heating system)													
	208.1078	145.6489	116.0273	54.4237	16.1303	0.0000	0.0000	0.0000	0.0000	56.8801	129.0195	203.3112	(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												
	280.0762	247.6892	262.9608	230.5819	223.1430	200.6453	197.6235	205.6462	208.1151	232.5945	247.9988	276.9190 (64)
Efficiency of water heater												167.9964 (216)
(217)m	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964	167.9964 (217)
Fuel for water heating, kWh/month												
	166.7156	147.4372	156.5276	137.2541	132.8261	119.4343	117.6356	122.4111	123.8807	138.4521	147.6215	164.8363 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	39.4133	31.6188	28.4692	20.8578	16.1111	13.1629	14.6971	19.1039	24.8141	32.5574	36.7735	40.5087 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	929.5488 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	167.9964
Water heating fuel used	1675.0323 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	318.0878 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	2922.6689 (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	929.5488	0.1563	145.2467	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1675.0323	0.1409	236.0755	(264)
Space and water heating			381.3222	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	318.0878	0.1443	45.9099	(268)
Total CO2, kg/year			427.2321	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.2700	(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	929.5488	1.5785	1467.2634	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1675.0323	1.5211	2547.9571	(278)
Space and water heating			4015.2205	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	318.0878	1.5338	487.8938	(282)
Total Primary energy kWh/year			4503.1143	(286)
Dwelling Primary energy Rate (DPER)			45.0300	(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	50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
First floor	50.0000 (1c)	x	2.4000 (2c)	=	120.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	240.0000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80	=	0.0000 (6a)
Number of open flues	0 * 20	=	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10	=	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20	=	0.0000 (6d)
Number of flues attached to other heater	0 * 35	=	0.0000 (6e)
Number of blocked chimneys	0 * 20	=	0.0000 (6f)
Number of intermittent extract fans	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)	=	0.1250 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3750 (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)	=	0.3187 (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	0.4064	0.3984	0.3905	0.3506	0.3427	0.3028	0.3028	0.2948	0.3187	0.3427	0.3586	0.3745	(22b)
Effective ac	0.5826	0.5794	0.5762	0.5615	0.5587	0.5458	0.5458	0.5435	0.5508	0.5587	0.5643	0.5701	(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 Opening Type (Uw = 1.20)			10.6000	1.1450	12.1374			(27)
Heatloss Floor 1			50.0000	0.1300	6.5000			(28a)
External Wall 1	100.0000	10.6000	89.4000	0.1800	16.0920			(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000			(30)
Total net area of external elements Aum(A, m2)			200.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.2294			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 229.3600 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	21.0000	0.1600	3.3600
E6 Intermediate floor within a dwelling	21.0000	0.0000	0.0000
E16 Corner (normal)	9.6000	0.0900	0.8640
E18 Party wall between dwellings	9.6000	0.0600	0.5760
E2 Other lintels (including other steel lintels)	14.0500	0.0500	0.7025
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	32.9000	0.0500	1.6450
E10 Eaves (insulation at ceiling level)	11.0000	0.0600	0.6600
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9475 (36)
Point Thermal bridges	(36a)	=	0.0000
Total fabric heat loss	(33) + (36) + (36a)	=	49.1769 (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	46.1406	45.8866	45.6376	44.4683	44.2496	43.2311	43.2311	43.0425	43.6234	44.2496	44.6921	45.1548	(38)
Heat transfer coeff	95.3175	95.0635	94.8146	93.6452	93.4265	92.4080	92.4080	92.2194	92.8003	93.4265	93.8690	94.3317	(39)
Average = Sum(39)m / 12 =												93.6442	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9532	0.9506	0.9481	0.9365	0.9343	0.9241	0.9241	0.9222	0.9280	0.9343	0.9387	0.9433	(40)
HLP (average)												0.9364	
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												2.7395	(42)
Hot water usage for mixer showers													
	70.1526	69.0984	67.5621	64.6228	62.4536	60.0345	58.6596	60.1842	61.8555	64.4528	67.4553	69.8838	(42a)
Hot water usage for baths													
	30.2911	29.8413	29.2078	28.0397	27.1651	26.1952	25.6714	26.3005	26.9854	28.0232	29.2153	30.1887	(42b)
Hot water usage for other uses													
	42.6855	41.1333	39.5811	38.0289	36.4767	34.9245	34.9245	36.4767	38.0289	39.5811	41.1333	42.6855	(42c)
Average daily hot water use (litres/day)												131.5680	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	143.1293	140.0729	136.3510	130.6913	126.0953	121.1543	119.2554	122.9613	126.8698	132.0570	137.8038	142.7581	(44)
Energy conte	226.6818	199.4620	209.5664	178.9099	169.7486	148.9733	144.2291	152.2518	156.4431	179.2001	196.3268	223.5246	(45)
Energy content (annual)										Total = Sum(45)m =		2185.3176	
Distribution loss (46)m = 0.15 x (45)m													
	34.0023	29.9193	31.4350	26.8365	25.4623	22.3460	21.6344	22.8378	23.4665	26.8800	29.4490	33.5287	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	273.2767	241.5477	256.1613	224.0018	216.3435	194.0651	190.8240	198.8467	201.5349	225.7950	241.4187	270.1195	(62)
WWHRS	-32.0709	-28.3637	-29.7009	-24.5935	-22.9202	-19.6130	-18.3841	-19.5496	-20.2924	-23.9225	-27.1013	-31.4769	(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													
	241.2058	213.1840	226.4604	199.4083	193.4232	174.4521	172.4399	179.2971	181.2426	201.8726	214.3174	238.6426	(64)
										Total per year (kWh/year) = Sum(64)m =		2435.9460	(64)
12Total per year (kWh/year)												2436	(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													
	112.6476	99.9897	106.9567	95.5610	93.7173	85.6071	85.2321	87.8997	88.0908	96.8600	101.3521	111.5979	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	136.9763	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	147.4525	163.2510	147.4525	152.3676	147.4525	152.3676	147.4525	147.4525	152.3676	147.4525	152.3676	147.4525	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	256.3278	258.9876	252.2848	238.0153	220.0027	203.0733	191.7634	189.1036	195.8064	210.0759	228.0885	245.0179	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	36.6976	(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)													
	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	-109.5810	(71)
Water heating gains (Table 5)													
	151.4081	148.7942	143.7591	132.7236	125.9641	118.8987	114.5593	118.1447	122.3483	130.1881	140.7669	149.9971	(72)
Total internal gains													
	622.2812	638.1257	610.5893	590.1995	560.5122	538.4325	517.8681	518.7936	534.6152	554.8094	588.3159	609.5604	(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	4.7000	10.6334	0.6300	0.7000	0.7700	15.2736	(74)
East	5.9000	19.6403	0.6300	0.7000	0.7700	35.4137	(76)

Solar gains	50.6873	98.4653	163.6875	246.0599	311.2396	323.6372	306.0004	255.8119	192.3237	116.9479	62.9987	41.8553	(83)
Total gains	672.9685	736.5910	774.2768	836.2593	871.7518	862.0698	823.8685	774.6056	726.9389	671.7573	651.3146	651.4158	(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	66.8410	67.0195	67.1955	68.0345	68.1939	68.9454	68.9454	69.0864	68.6540	68.1939	67.8723	67.5394	

alpha	5.4561	5.4680	5.4797	5.5356	5.5463	5.5964	5.5964	5.6058	5.5769	5.5463	5.5248	5.5026	
util living area													
	0.9947	0.9904	0.9807	0.9435	0.8458	0.6575	0.4887	0.5390	0.7894	0.9562	0.9891	0.9956	(86)
MIT	19.9000	20.0443	20.2653	20.5882	20.8426	20.9705	20.9952	20.9920	20.9203	20.6058	20.2099	19.8812	(87)
Th 2	20.1225	20.1247	20.1268	20.1366	20.1385	20.1471	20.1471	20.1487	20.1438	20.1385	20.1347	20.1308	(88)
util rest of house													
	0.9932	0.9876	0.9749	0.9260	0.8016	0.5810	0.3965	0.4436	0.7208	0.9391	0.9854	0.9943	(89)
MIT 2	18.8374	19.0226	19.3039	19.7099	20.0009	20.1291	20.1453	20.1455	20.0871	19.7386	19.2419	18.8197	(90)
Living area fraction										fLA = Living area / (4) =		0.2500	(91)
MIT	19.1031	19.2780	19.5442	19.9295	20.2113	20.3394	20.3578	20.3571	20.2954	19.9554	19.4839	19.0851	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1031	19.2780	19.5442	19.9295	20.2113	20.3394	20.3578	20.3571	20.2954	19.9554	19.4839	19.0851	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9907	0.9840	0.9698	0.9210	0.8058	0.5989	0.4195	0.4674	0.7340	0.9346	0.9817	0.9921	(94)
Useful gains	666.7180	724.8154	750.9116	770.1716	702.4205	516.3358	345.6491	362.0617	533.6057	627.8043	639.3746	646.2797	(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													
	1410.9921	1366.8215	1236.7820	1032.8591	795.1834	530.3686	347.2508	364.9204	574.9343	874.0411	1162.4640	1404.1352	(97)
Space heating kWh													
	553.7399	431.4281	361.4876	189.1350	69.0156	0.0000	0.0000	0.0000	0.0000	183.2002	376.6244	563.8445	(98a)
Space heating requirement - total per year (kWh/year)												2728.4753	
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													
	553.7399	431.4281	361.4876	189.1350	69.0156	0.0000	0.0000	0.0000	0.0000	183.2002	376.6244	563.8445	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2728.4753	
Space heating per m2											(98c) / (4) =	27.2848	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.3000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	553.7399	431.4281	361.4876	189.1350	69.0156	0.0000	0.0000	0.0000	0.0000	183.2002	376.6244	563.8445	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	599.9349	467.4194	391.6442	204.9134	74.7731	0.0000	0.0000	0.0000	0.0000	198.4834	408.0438	610.8824	(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													
	241.2058	213.1840	226.4604	199.4083	193.4232	174.4521	172.4399	179.2971	181.2426	201.8726	214.3174	238.6426	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8617	85.6070	85.1031	83.9413	81.9852	79.8000	79.8000	79.8000	79.8000	83.8428	85.3106	85.9184	(217)
Fuel for water heating, kWh/month													
	280.9235	249.0265	266.1013	237.5568	235.9247	218.6117	216.0901	224.6831	227.1210	240.7752	251.2203	277.7550	(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	30.6377	24.5787	22.1304	16.2137	12.5239	10.2321	11.4247	14.8503	19.2891	25.3083	28.5857	31.4892	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.8440	-64.1351	-91.4528	-101.9369	-109.1268	-101.5301	-100.2579	-95.0489	-85.7174	-72.9317	-50.2198	-39.6919	(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	-27.3659	-57.4172	-113.8667	-170.6646	-225.3404	-226.3366	-223.6865	-189.5402	-139.1118	-82.0022	-36.4980	-21.6521	(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												2956.0946	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2925.7890	(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)	247.2639 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2471.3753 (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	3743.7723 (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	2956.0946	0.2100	620.7799	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2925.7890	0.2100	614.4157	(264)
Space and water heating			1235.1956	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	247.2639	0.1443	35.6878	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-957.8931	0.1348	-129.0951	
PV Unit electricity exported	-1513.4822	0.1260	-190.6306	
Total			-319.7256	(269)
Total CO2, kg/year			963.0870	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6300	(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	2956.0946	1.1300	3340.3869	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2925.7890	1.1300	3306.1416	(278)
Space and water heating			6646.5285	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	247.2639	1.5338	379.2617	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-957.8931	1.4981	-1435.0167	
PV Unit electricity exported	-1513.4822	0.4623	-699.7488	
Total			-2134.7655	(283)
Total Primary energy kWh/year			5021.1255	(286)
Target Primary Energy Rate (TPER)			50.2100	(287)

Full SAP Calculation Printout

Property Reference	House Type B	Issued on Date	05/10/2023
Assessment Reference	Plot 37	Prop Type Ref	
Property			

SAP Rating	81 B	DER	5.22	TER	13.49
Environmental	96 A	% DER < TER			61.30
CO_2 Emissions (t/year)	0.29	DFEE	34.52	TFEE	41.35
Compliance Check	See BREL	% DFEE < TFEE			16.51
% DPER < TPER	22.13	DPER	55.09	TPER	70.74

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	61.0000 (1b)	x	2.4000 (2b)	=	146.4000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	146.4000	(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	1 * 10 =	10.0000 (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) =	10.0000 / (5) =	0.0683 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2683 (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) =	0.2281 (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	0.2908	0.2851	0.2794	0.2509	0.2452	0.2167	0.2167	0.2110	0.2281	0.2452	0.2566	0.2680	(22b)
Effective ac	0.5423	0.5406	0.5390	0.5315	0.5301	0.5235	0.5235	0.5223	0.5260	0.5301	0.5329	0.5359	(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	
Opening Type 1 (Uw = 1.20)			14.7700	1.1450	16.9122			(27)
Heatloss Floor 1			61.0000	0.1200	7.3200	110.0000	6710.0000	(28a)
External Wall 1	75.0000	14.7700	60.2300	0.1900	11.4437	190.0000	11443.7000	(29a)
Total net area of external elements Aum(A, m2)			136.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.6759			(33)
Party Ceiling 1			61.0000			30.0000	1830.0000	(32b)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			19983.7000	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 327.6016 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	31.0000	0.0670	2.0770
E16 Corner (normal)	9.6000	0.0410	0.3936
E2 Other lintels (including other steel lintels)	9.2000	0.0240	0.2208
E3 Sill	7.7000	0.0190	0.1463
E4 Jamb	27.6000	0.0140	0.3864
E7 Party floor between dwellings (in blocks of flats)	31.0000	0.0510	1.5810

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.8051 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.4810 (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	26.1984	26.1191	26.0414	25.6762	25.6079	25.2899	25.2899	25.2310	25.4124	25.6079	25.7461	25.8906	(38)
Heat transfer coeff	66.6794	66.6001	66.5224	66.1572	66.0889	65.7709	65.7709	65.7120	65.8934	66.0889	66.2271	66.3716	(39)
Average = Sum(39)m / 12 =												66.1569	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0931	1.0918	1.0905	1.0845	1.0834	1.0782	1.0782	1.0772	1.0802	1.0834	1.0857	1.0881	(40)
HLP (average)												1.0845	
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 2.0098 (42)
Hot water usage for mixer showers

57.9167	57.0463	55.7780	53.3513	51.5605	49.5634	48.4282	49.6869	51.0667	53.2110	55.6898	57.6948	(42a)

Hot water usage for baths

25.0293	24.6576	24.1341	23.1690	22.4462	21.6449	21.2120	21.7318	22.2978	23.1553	24.1403	24.9447	(42b)

Hot water usage for other uses

35.2120	33.9315	32.6511	31.3707	30.0902	28.8098	28.8098	30.0902	31.3707	32.6511	33.9315	35.2120	(42c)

Average daily hot water use (litres/day) 108.6142 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	118.1580	115.6354	112.5632	107.8910	104.0970	100.0181	98.4501	101.5090	104.7352	109.0174	113.7617	117.8515	(44)
Energy conte	187.1333	164.6633	173.0055	147.6973	140.1346	122.9839	119.0668	125.6893	129.1490	147.9356	162.0744	184.5269	(45)
Energy content (annual)										Total = Sum(45)m =		1804.0599	
Distribution loss (46)m = 0.15 x (45)m	28.0700	24.6995	25.9508	22.1546	21.0202	18.4476	17.8600	18.8534	19.3723	22.1903	24.3112	27.6790	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

240.5277	212.8905	226.3999	199.3693	193.5290	174.6559	172.4612	179.0837	180.8210	201.3300	213.7464	237.9213	(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

240.5277	212.8905	226.3999	199.3693	193.5290	174.6559	172.4612	179.0837	180.8210	201.3300	213.7464	237.9213	(64)

Total per year (kWh/year) = Sum(64)m = 2432.7359 (64)
12Total per year (kWh/year) 2433 (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

104.9374	93.3323	100.2399	90.4470	89.3103	82.2297	82.3052	84.5072	84.2796	91.9041	95.2273	104.0707	(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	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	88.5003	97.9825	88.5003	91.4503	88.5003	91.4503	88.5003	88.5003	91.4503	88.5003	91.4503	88.5003	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.4617	177.2825	172.6943	162.9265	150.5964	139.0079	131.2661	129.4454	134.0336	143.8013	156.1314	167.7199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	(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)	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	(71)
Water heating gains (Table 5)	141.0448	138.8874	134.7310	125.6208	120.0407	114.2080	110.6253	113.5850	117.0550	123.5270	132.2602	139.8800	(72)
Total internal gains	458.1533	467.2988	449.0720	433.1440	412.2839	397.8127	383.5381	384.6771	395.6853	408.9751	432.9883	449.2466	(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	5.3600	10.6334	0.7600	0.7000	0.7700	21.0127	(74)
East	5.0000	19.6403	0.7600	0.7000	0.7700	36.2045	(76)
West	4.4100	19.6403	0.7600	0.7000	0.7700	31.9323	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	89.1495	173.4464	287.7451	429.7454	539.9919	559.6952	529.9423	445.5302	337.3400	205.9607	110.8804	73.5496	(83)
Total gains	547.3028	640.7451	736.8171	862.8894	952.2757	957.5079	913.4805	830.2073	733.0253	614.9358	543.8687	522.7962	(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	83.2495	83.3486	83.4460	83.9066	83.9933	84.3994	84.3994	84.4751	84.2425	83.9933	83.8180	83.6356	
alpha	6.5500	6.5566	6.5631	6.5938	6.5996	6.6266	6.6266	6.6317	6.6162	6.5996	6.5879	6.5757	
util living area	0.9951	0.9860	0.9536	0.8336	0.6322	0.4385	0.3167	0.3638	0.6100	0.9115	0.9870	0.9963	(86)
Living	20.1905	20.3731	20.6272	20.8843	20.9821	20.9985	20.9999	20.9997	20.9893	20.8193	20.4533	20.1539	
Non living	19.0867	19.3174	19.6283	19.9151	20.0029	20.0181	20.0186	20.0194	20.0119	19.8588	19.4246	19.0435	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5859	20.3731	20.6272	20.8843	20.9821	20.9985	20.9999	20.9997	20.9893	20.8193	20.4533	20.2723	(87)
Th 2	20.0065	20.0075	20.0086	20.0135	20.0144	20.0187	20.0187	20.0195	20.0170	20.0144	20.0125	20.0106	(88)
util rest of house	0.9931	0.9805	0.9370	0.7897	0.5704	0.3719	0.2461	0.2864	0.5280	0.8734	0.9809	0.9948	(89)
MIT 2	19.6398	19.3174	19.6283	19.9151	20.0029	20.0181	20.0186	20.0194	20.0119	19.8588	19.4246	19.2178	(90)
Living area fraction									fLA = Living area / (4) =			0.4098	(91)
MIT	20.0275	19.7501	20.0377	20.3123	20.4042	20.4199	20.4208	20.4211	20.4124	20.2525	19.8462	19.6499	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0275	19.7501	20.0377	20.3123	20.4042	20.4199	20.4208	20.4211	20.4124	20.2525	19.8462	19.6499	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9932	0.9788	0.9376	0.8038	0.5953	0.3992	0.2751	0.3182	0.5616	0.8838	0.9796	0.9941	(94)
Useful gains	543.5780	627.1300	690.8459	693.6131	566.8909	382.2524	251.2609	264.1460	411.6543	543.4745	532.7882	519.7242	(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	1048.7029	989.0151	900.5585	755.0073	575.2531	382.7808	251.2961	264.2369	415.9479	637.9208	844.1443	1025.4377	(97)
Space heating kWh	375.8129	243.1868	156.0262	44.2038	6.2215	0.0000	0.0000	0.0000	0.0000	70.2681	224.1764	376.2509	(98a)
Space heating requirement - total per year (kWh/year)												1496.1466	
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	375.8129	243.1868	156.0262	44.2038	6.2215	0.0000	0.0000	0.0000	0.0000	70.2681	224.1764	376.2509	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1496.1466	
Space heating per m2										(98c) / (4) =		24.5270	(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 %) 253.1227 (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	375.8129	243.1868	156.0262	44.2038	6.2215	0.0000	0.0000	0.0000	0.0000	70.2681	224.1764	376.2509	(98)
Space heating efficiency (main heating system 1)	253.1227	253.1227	253.1227	253.1227	253.1227	0.0000	0.0000	0.0000	0.0000	253.1227	253.1227	253.1227	(210)
Space heating fuel (main heating system)	148.4707	96.0747	61.6406	17.4634	2.4579	0.0000	0.0000	0.0000	0.0000	27.7605	88.5643	148.6437	(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

	240.5277	212.8905	226.3999	199.3693	193.5290	174.6559	172.4612	179.0837	180.8210	201.3300	213.7464	237.9213 (64)
Efficiency of water heater												172.6502 (216)
(217)m	172.6502	172.6502	172.6502	172.6502	172.6502	172.6502	172.6502	172.6502	172.6502	172.6502	172.6502	172.6502 (217)
Fuel for water heating, kWh/month												
	139.3150	123.3074	131.1321	115.4759	112.0931	101.1617	99.8905	103.7263	104.7325	116.6115	123.8031	137.8054 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	22.7258	18.2315	16.4154	12.0266	9.2897	7.5898	8.4744	11.0153	14.3078	18.7727	21.2037	23.3574 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	591.0757 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	172.6502
Water heating fuel used	1409.0545 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	183.4101 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	2183.5402 (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	591.0757	0.1577	93.2029	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1409.0545	0.1408	198.4478	(264)
Space and water heating			291.6507	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	183.4101	0.1443	26.4717	(268)
Total CO2, kg/year			318.1224	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.2200	(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	591.0757	1.5837	936.0827	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1409.0545	1.5208	2142.8380	(278)
Space and water heating			3078.9207	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	183.4101	1.5338	281.3205	(282)
Total Primary energy kWh/year			3360.2412	(286)
Dwelling Primary energy Rate (DPER)			55.0900	(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	61.0000 (1b)	x	2.4000 (2b)	=	146.4000 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	146.4000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1366	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3866	(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) =	0.3286	(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	0.4190	0.4108	0.4026	0.3615	0.3533	0.3122	0.3122	0.3040	0.3286	0.3533	0.3697	0.3861	(22b)
Effective ac	0.5878	0.5844	0.5810	0.5653	0.5624	0.5487	0.5487	0.5462	0.5540	0.5624	0.5683	0.5745	(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 Opening Type (Uw = 1.20)			14.7700	1.1450	16.9122			(27)
Heatloss Floor 1			61.0000	0.1300	7.9300			(28a)
External Wall 1	75.0000	14.7700	60.2300	0.1800	10.8414			(29a)
Total net area of external elements Aum(A, m2)			136.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.6836			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 337.6016 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	31.0000	0.1600	4.9600
E16 Corner (normal)	9.6000	0.0900	0.8640
E2 Other lintels (including other steel lintels)	9.2000	0.0500	0.4600
E3 Sill	7.7000	0.0500	0.3850
E4 Jamb	27.6000	0.0500	1.3800
E7 Party floor between dwellings (in blocks of flats)	31.0000	0.0700	2.1700

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.2190 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 45.9026 (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	28.3967	28.2320	28.0706	27.3125	27.1706	26.5103	26.5103	26.3880	26.7646	27.1706	27.4576	27.7575	(38)
Heat transfer coeff	74.2993	74.1346	73.9732	73.2151	73.0732	72.4129	72.4129	72.2906	72.6673	73.0732	73.3602	73.6602	(39)

Average = Sum(39)m / 12 = 73.2144

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2180	1.2153	1.2127	1.2002	1.1979	1.1871	1.1871	1.1851	1.1913	1.1979	1.2026	1.2075	(40)
HLP (average)												1.2002	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0098 (42)

Hot water usage for mixer showers

57.9167	57.0463	55.7780	53.3513	51.5605	49.5634	48.4282	49.6869	51.0667	53.2110	55.6898	57.6948	(42a)

Hot water usage for baths

	25.0293	24.6576	24.1341	23.1690	22.4462	21.6449	21.2120	21.7318	22.2978	23.1553	24.1403	24.9447 (42b)
Hot water usage for other uses												
	35.2120	33.9315	32.6511	31.3707	30.0902	28.8098	28.8098	30.0902	31.3707	32.6511	33.9315	35.2120 (42c)
Average daily hot water use (litres/day)												108.6142 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	118.1580	115.6354	112.5632	107.8910	104.0970	100.0181	98.4501	101.5090	104.7352	109.0174	113.7617	117.8515	(44)
Energy conte	187.1333	164.6633	173.0055	147.6973	140.1346	122.9839	119.0668	125.6893	129.1490	147.9356	162.0744	184.5269	(45)
Energy content (annual)										Total = Sum(45)m =		1804.0599	
Distribution loss (46)m = 0.15 x (45)m													
	28.0700	24.6995	25.9508	22.1546	21.0202	18.4476	17.8600	18.8534	19.3723	22.1903	24.3112	27.6790	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	233.7282	206.7490	219.6004	192.7892	186.7295	168.0757	165.6617	172.2843	174.2408	194.5305	207.1662	231.1218	(62)
WWHRS	-26.4771	-23.4166	-24.5205	-20.3039	-18.9225	-16.1921	-15.1775	-16.1398	-16.7530	-19.7500	-22.3743	-25.9868	(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													
	207.2512	183.3325	195.0799	172.4853	167.8069	151.8836	150.4842	156.1445	157.4878	174.7805	184.7919	205.1350	(64)
									Total per year (kWh/year) = Sum(64)m =			2106.6633	(64)
12Total per year (kWh/year)												2107	(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													
	99.4978	88.4191	94.8003	85.1828	83.8707	76.9656	76.8656	79.0676	79.0155	86.4645	89.9632	98.6311	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	88.5003	97.9825	88.5003	91.4503	88.5003	91.4503	88.5003	88.5003	91.4503	88.5003	91.4503	88.5003	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	175.4617	177.2825	172.6943	162.9265	150.5964	139.0079	131.2661	129.4454	134.0336	143.8013	156.1314	167.7199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	(71)
Water heating gains (Table 5)													
	133.7335	131.5761	127.4197	118.3095	112.7294	106.8967	103.3140	106.2737	109.7437	116.2157	124.9489	132.5687	(72)
Total internal gains													
	453.8420	462.9875	444.7607	428.8327	407.9726	390.5014	376.2269	377.3658	388.3741	404.6638	428.6770	444.9353	(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	5.3600	10.6334	0.6300	0.7000	0.7700	17.4184	(74)
East	5.0000	19.6403	0.6300	0.7000	0.7700	30.0116	(76)
West	4.4100	19.6403	0.6300	0.7000	0.7700	26.4702	(80)

Solar gains	73.9002	143.7779	238.5256	356.2363	447.6248	463.9579	439.2943	369.3211	279.6371	170.7306	91.9141	60.9688	(83)
Total gains	527.7423	606.7654	683.2863	785.0690	855.5974	854.4593	815.5212	746.6869	668.0111	575.3944	520.5911	505.9041	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)													
tau	76.9923	77.1633	77.3317	78.1324	78.2841	78.9980	78.9980	79.1316	78.7215	78.2841	77.9779	77.6603	
alpha	6.1328	6.1442	6.1554	6.2088	6.2189	6.2665	6.2665	6.2754	6.2481	6.2189	6.1985	6.1774	
util living area													
	0.9970	0.9922	0.9765	0.9076	0.7461	0.5369	0.3900	0.4438	0.7150	0.9503	0.9924	0.9976	(86)
MIT	20.0260	20.1935	20.4470	20.7631	20.9437	20.9936	20.9993	20.9984	20.9674	20.7086	20.3128	19.9998	(87)
Th 2	19.9056	19.9078	19.9099	19.9198	19.9217	19.9303	19.9303	19.9319	19.9270	19.9217	19.9179	19.9140	(88)
util rest of house													

	0.9956	0.9889	0.9663	0.8728	0.6770	0.4500	0.2956	0.3417	0.6199	0.9228	0.9884	0.9966 (89)
MIT 2	18.7967	19.0110	19.3293	19.7065	19.8839	19.9278	19.9302	19.9316	19.9106	19.6583	19.1717	18.7697 (90)
Living area fraction										fLA = Living area / (4) =		0.4098 (91)
MIT	19.3005	19.4956	19.7874	20.1395	20.3183	20.3646	20.3683	20.3688	20.3437	20.0887	19.6394	19.2739 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3005	19.4956	19.7874	20.1395	20.3183	20.3646	20.3683	20.3688	20.3437	20.0887	19.6394	19.2739 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9946	0.9872	0.9649	0.8807	0.7036	0.4857	0.3344	0.3837	0.6585	0.9279	0.9870	0.9957	(94)
Useful gains	524.8927	599.0177	659.2920	691.4114	602.0080	415.0207	272.6858	286.4710	439.8970	533.9058	513.8487	503.7532	(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													
	1114.5283	1082.0425	982.9111	822.9043	629.7634	417.4319	272.8762	286.9083	453.7159	693.3725	919.8895	1110.3431	(97)
Space heating kWh													
	438.6889	324.5927	240.7726	94.6748	20.6500	0.0000	0.0000	0.0000	0.0000	118.6432	292.3494	451.3029	(98a)
Space heating requirement - total per year (kWh/year)												1981.6746	
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													
	438.6889	324.5927	240.7726	94.6748	20.6500	0.0000	0.0000	0.0000	0.0000	118.6432	292.3494	451.3029	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1981.6746	
Space heating per m2											(98c) / (4) =	32.4865	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	438.6889	324.5927	240.7726	94.6748	20.6500	0.0000	0.0000	0.0000	0.0000	118.6432	292.3494	451.3029	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	475.2859	351.6714	260.8587	102.5729	22.3727	0.0000	0.0000	0.0000	0.0000	128.5409	316.7383	488.9523	(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													
	207.2512	183.3325	195.0799	172.4853	167.8069	151.8836	150.4842	156.1445	157.4878	174.7805	184.7919	205.1350	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6989	85.3265	84.5328	82.7729	80.6962	79.8000	79.8000	79.8000	79.8000	83.2100	85.0836	85.7769	(217)
Fuel for water heating, kWh/month													
	241.8365	214.8599	230.7741	208.3837	207.9491	190.3303	188.5767	195.6697	197.3531	210.0475	217.1886	239.1496	(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	18.3886	14.7520	13.2826	9.7314	7.5168	6.1413	6.8571	8.9131	11.5772	15.1899	17.1570	18.8997	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-28.8264	-40.7934	-58.8744	-66.5007	-72.0011	-67.3464	-66.5413	-62.6840	-55.9057	-46.8061	-31.7556	-24.9063	(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	-15.8316	-33.3535	-66.3705	-99.7862	-132.0239	-132.6522	-131.0648	-110.9153	-81.2402	-47.7035	-21.1423	-12.5135	(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												2146.9930	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2542.1189	(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)												148.4066	(232)

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

PV generation	-1507.5389 (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	3415.9796 (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	2146.9930	0.2100	450.8685	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2542.1189	0.2100	533.8450	(264)
Space and water heating			984.7135	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	148.4066	0.1443	21.4197	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-622.9414	0.1345	-83.7764	
PV Unit electricity exported	-884.5975	0.1259	-111.3453	
Total			-195.1217	(269)
Total CO2, kg/year			822.9407	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.4900	(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	2146.9930	1.1300	2426.1021	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2542.1189	1.1300	2872.5943	(278)
Space and water heating			5298.6965	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	148.4066	1.5338	227.6311	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-622.9414	1.4970	-932.5612	
PV Unit electricity exported	-884.5975	0.4620	-408.7133	
Total			-1341.2745	(283)
Total Primary energy kWh/year			4315.1539	(286)
Target Primary Energy Rate (TPER)			70.7400	(287)

Full SAP Calculation Printout

Property Reference	House Type B	Issued on Date	05/10/2023
Assessment Reference	Plot 38	Prop Type Ref	
Property			

SAP Rating	81 B	DER	5.16	TER	12.13
Environmental	96 A	% DER < TER			57.46
CO_2 Emissions (t/year)	0.29	DFEE	33.05	TFEE	34.84
Compliance Check	See BREL	% DFEE < TFEE			5.15
% DPER < TPER	14.01	DPER	54.53	TPER	63.41

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	61.0000 (1b)	x	2.4000 (2b)	=	146.4000	(1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	146.4000	(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	1 * 10 =	10.0000 (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) =	10.0000 / (5) =	0.0683 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2683 (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) =	0.2281 (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	0.2908	0.2851	0.2794	0.2509	0.2452	0.2167	0.2167	0.2110	0.2281	0.2452	0.2566	0.2680	(22b)
Effective ac	0.5423	0.5406	0.5390	0.5315	0.5301	0.5235	0.5235	0.5223	0.5260	0.5301	0.5329	0.5359	(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	
Opening Type 1 (Uw = 1.20)			13.9600	1.1450	15.9847			(27)
External Wall 1	75.0000	13.9600	61.0400	0.1900	11.5976	190.0000	11597.6000	(29a)
External Roof 1	61.0000		61.0000	0.1600	9.7600	9.0000	549.0000	(30)
Total net area of external elements Aum(A, m2)			136.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.3423			(33)
Party Floor 1			61.0000			40.0000	2440.0000	(32d)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		14586.6000	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 239.1246 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E16 Corner (normal)	9.6000	0.0410	0.3936
E2 Other lintels (including other steel lintels)	9.2000	0.0240	0.2208
E3 Sill	7.7000	0.0190	0.1463
E4 Jamb	27.6000	0.0140	0.3864
E7 Party floor between dwellings (in blocks of flats)	31.0000	0.0510	1.5810
E11 Eaves (insulation at rafter level)	31.0000	0.0110	0.3410

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.0691 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 40.4114 (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	26.1984	26.1191	26.0414	25.6762	25.6079	25.2899	25.2899	25.2310	25.4124	25.6079	25.7461	25.8906	(38)
Heat transfer coeff	66.6098	66.5305	66.4528	66.0877	66.0193	65.7013	65.7013	65.6424	65.8238	66.0193	66.1575	66.3020	(39)

Average = Sum(39)m / 12 = 66.0873

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0920	1.0907	1.0894	1.0834	1.0823	1.0771	1.0771	1.0761	1.0791	1.0823	1.0845	1.0869	(40)
HLP (average)												1.0834	
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 2.0098 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	57.9167	57.0463	55.7780	53.3513	51.5605	49.5634	48.4282	49.6869	51.0667	53.2110	55.6898	57.6948	(42a)
Hot water usage for baths	25.0293	24.6576	24.1341	23.1690	22.4462	21.6449	21.2120	21.7318	22.2978	23.1553	24.1403	24.9447	(42b)
Hot water usage for other uses	35.2120	33.9315	32.6511	31.3707	30.0902	28.8098	28.8098	30.0902	31.3707	32.6511	33.9315	35.2120	(42c)

Average daily hot water use (litres/day) 108.6142 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	118.1580	115.6354	112.5632	107.8910	104.0970	100.0181	98.4501	101.5090	104.7352	109.0174	113.7617	117.8515	(44)
Energy conte	187.1333	164.6633	173.0055	147.6973	140.1346	122.9839	119.0668	125.6893	129.1490	147.9356	162.0744	184.5269	(45)

Energy content (annual) Total = Sum(45)m = 1804.0599

Distribution loss (46)m = 0.15 x (45)m	28.0700	24.6995	25.9508	22.1546	21.0202	18.4476	17.8600	18.8534	19.3723	22.1903	24.3112	27.6790	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9720 (55)

Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	240.5277	212.8905	226.3999	199.3693	193.5290	174.6559	172.4612	179.0837	180.8210	201.3300	213.7464	237.9213	(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	240.5277	212.8905	226.3999	199.3693	193.5290	174.6559	172.4612	179.0837	180.8210	201.3300	213.7464	237.9213	(64)

Total per year (kWh/year) = Sum(64)m = 2432.7359 (64)

12Total per year (kWh/year) 2433 (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	104.9374	93.3323	100.2399	90.4470	89.3103	82.2297	82.3052	84.5072	84.2796	91.9041	95.2273	104.0707	(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	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	88.5003	97.9825	88.5003	91.4503	88.5003	91.4503	88.5003	88.5003	91.4503	88.5003	91.4503	88.5003	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.4617	177.2825	172.6943	162.9265	150.5964	139.0079	131.2661	129.4454	134.0336	143.8013	156.1314	167.7199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	(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)	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	(71)
Water heating gains (Table 5)	141.0448	138.8874	134.7310	125.6208	120.0407	114.2080	110.6253	113.5850	117.0550	123.5270	132.2602	139.8800	(72)
Total internal gains	458.1533	467.2988	449.0720	433.1440	412.2839	397.8127	383.5381	384.6771	395.6853	408.9751	432.9883	449.2466	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	2.4500	10.6334	0.7600	0.7000	0.7700	9.6047 (74)
East	6.1600	19.6403	0.7600	0.7000	0.7700	44.6039 (76)
South	2.0500	46.7521	0.7600	0.7000	0.7700	35.3345 (78)
West	3.3000	19.6403	0.7600	0.7000	0.7700	23.8949 (80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	113.4381	210.2222	325.5805	455.2552	548.7360	559.5677	533.4914	462.9910	371.1592	243.2666	139.1421	94.8694	(83)
Total gains	571.5914	677.5210	774.6525	888.3992	961.0198	957.3803	917.0295	847.6681	766.8446	652.2416	572.1304	544.1160	(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	60.8293	60.9019	60.9731	61.3100	61.3734	61.6705	61.6705	61.7258	61.5557	61.3734	61.2452	61.1118	
alpha	5.0553	5.0601	5.0649	5.0873	5.0916	5.1114	5.1114	5.1151	5.1037	5.0916	5.0830	5.0741	
util living area	0.9829	0.9614	0.9115	0.7888	0.6137	0.4355	0.3147	0.3550	0.5749	0.8565	0.9641	0.9863	(86)
Living	19.9869	20.2274	20.5261	20.8178	20.9553	20.9935	20.9990	20.9982	20.9754	20.7641	20.3219	19.9369	
Non living	18.8570	19.1566	19.5176	19.8477	19.9821	20.0162	20.0193	20.0198	20.0034	19.8025	19.2824	18.7972	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4818	20.2274	20.5261	20.8178	20.9553	20.9935	20.9990	20.9982	20.9754	20.7641	20.3219	20.0856	(87)
Th 2	20.0074	20.0085	20.0095	20.0144	20.0153	20.0196	20.0196	20.0204	20.0180	20.0153	20.0135	20.0115	(88)
util rest of house	0.9781	0.9512	0.8901	0.7475	0.5566	0.3704	0.2449	0.2801	0.5000	0.8151	0.9528	0.9824	(89)
MIT 2	19.5488	19.1566	19.5176	19.8477	19.9821	20.0162	20.0193	20.0198	20.0034	19.8025	19.2824	19.0161	(90)
Living area fraction									fLA = Living area / (4) =			0.4098	(91)
MIT	19.9312	19.5955	19.9309	20.2453	20.3809	20.4167	20.4208	20.4208	20.4018	20.1966	19.7085	19.4544	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9312	19.5955	19.9309	20.2453	20.3809	20.4167	20.4208	20.4208	20.4018	20.1966	19.7085	19.4544	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9777	0.9462	0.8882	0.7577	0.5783	0.3970	0.2735	0.3108	0.5299	0.8235	0.9486	0.9796	(94)
Useful gains	558.8176	641.0537	688.0357	673.1345	555.7217	380.0582	250.7900	263.4673	406.3334	537.0947	542.7236	533.0391	(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	1041.1889	977.6976	892.5215	749.7829	573.1098	382.1669	251.0326	263.9327	414.8071	633.5632	834.1454	1011.3975	(97)
Space heating kWh	358.8842	226.2247	152.1375	55.1868	12.9368	0.0000	0.0000	0.0000	0.0000	71.7726	209.8237	355.8986	(98a)
Space heating requirement - total per year (kWh/year)												1442.8649	
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	358.8842	226.2247	152.1375	55.1868	12.9368	0.0000	0.0000	0.0000	0.0000	71.7726	209.8237	355.8986	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1442.8649	
Space heating per m2											(98c) / (4) =	23.6535	(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 %)	253.1323 (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	358.8842	226.2247	152.1375	55.1868	12.9368	0.0000	0.0000	0.0000	0.0000	71.7726	209.8237	355.8986	(98)
Space heating efficiency (main heating system 1)	253.1323	253.1323	253.1323	253.1323	253.1323	0.0000	0.0000	0.0000	0.0000	253.1323	253.1323	253.1323	(210)
Space heating fuel (main heating system)	141.7774	89.3702	60.1020	21.8016	5.1107	0.0000	0.0000	0.0000	0.0000	28.3538	82.8909	140.5979	(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

	240.5277	212.8905	226.3999	199.3693	193.5290	174.6559	172.4612	179.0837	180.8210	201.3300	213.7464	237.9213 (64)
Efficiency of water heater												172.6600 (216)
(217)m	172.6600	172.6600	172.6600	172.6600	172.6600	172.6600	172.6600	172.6600	172.6600	172.6600	172.6600	172.6600 (217)
Fuel for water heating, kWh/month												
	139.3071	123.3004	131.1247	115.4693	112.0867	101.1560	99.8849	103.7205	104.7266	116.6049	123.7961	137.7976 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	22.7258	18.2315	16.4154	12.0266	9.2897	7.5898	8.4744	11.0153	14.3078	18.7727	21.2037	23.3574 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	570.0044 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	172.6600
Water heating fuel used	1408.9747 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	183.4101 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	2162.3892 (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	570.0044	0.1573	89.6869	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1408.9747	0.1408	198.4365	(264)
Space and water heating			288.1234	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	183.4101	0.1443	26.4717	(268)
Total CO2, kg/year			314.5951	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.1600	(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	570.0044	1.5824	901.9971	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1408.9747	1.5208	2142.7167	(278)
Space and water heating			3044.7138	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	183.4101	1.5338	281.3205	(282)
Total Primary energy kWh/year			3326.0343	(286)
Dwelling Primary energy Rate (DPER)			54.5300	(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	61.0000 (1b)	x	2.4000 (2b)	=	146.4000 (1b)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	146.4000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1366	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3866	(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) =	0.3286	(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	0.4190	0.4108	0.4026	0.3615	0.3533	0.3122	0.3122	0.3040	0.3286	0.3533	0.3697	0.3861	(22b)
Effective ac	0.5878	0.5844	0.5810	0.5653	0.5624	0.5487	0.5487	0.5462	0.5540	0.5624	0.5683	0.5745	(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 Opening Type (Uw = 1.20)			13.9600	1.1450	15.9847			(27)
External Wall 1	75.0000	13.9600	61.0400	0.1800	10.9872			(29a)
External Roof 1	61.0000		61.0000	0.1100	6.7100			(30)
Total net area of external elements Aum(A, m2)			136.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.6819			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	239.1246	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E16 Corner (normal)	9.6000	0.0900	0.8640
E2 Other lintels (including other steel lintels)	9.2000	0.0500	0.4600
E3 Sill	7.7000	0.0500	0.3850
E4 Jamb	27.6000	0.0500	1.3800
E7 Party floor between dwellings (in blocks of flats)	31.0000	0.0700	2.1700
E11 Eaves (insulation at rafter level)	31.0000	0.0400	1.2400

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.4990	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	40.1809	(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	28.3967	28.2320	28.0706	27.3125	27.1706	26.5103	26.5103	26.3880	26.7646	27.1706	27.4576	27.7575	(38)
Heat transfer coeff	68.5776	68.4129	68.2515	67.4934	67.3515	66.6912	66.6912	66.5689	66.9456	67.3515	67.6385	67.9385	(39)

Average = Sum(39)m / 12 =	67.4927

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1242	1.1215	1.1189	1.1064	1.1041	1.0933	1.0933	1.0913	1.0975	1.1041	1.1088	1.1137	(40)
HLP (average)												1.1064	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0098 (42)

Hot water usage for mixer showers

57.9167	57.0463	55.7780	53.3513	51.5605	49.5634	48.4282	49.6869	51.0667	53.2110	55.6898	57.6948	(42a)

Hot water usage for baths
25.0293 24.6576 24.1341 23.1690 22.4462 21.6449 21.2120 21.7318 22.2978 23.1553 24.1403 24.9447 (42b)
Hot water usage for other uses
35.2120 33.9315 32.6511 31.3707 30.0902 28.8098 28.8098 30.0902 31.3707 32.6511 33.9315 35.2120 (42c)
Average daily hot water use (litres/day) 108.6142 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	118.1580	115.6354	112.5632	107.8910	104.0970	100.0181	98.4501	101.5090	104.7352	109.0174	113.7617	117.8515	(44)
Energy conte	187.1333	164.6633	173.0055	147.6973	140.1346	122.9839	119.0668	125.6893	129.1490	147.9356	162.0744	184.5269	(45)
Energy content (annual)										Total = Sum(45)m =		1804.0599	

Distribution loss (46)m = 0.15 x (45)m
28.0700 24.6995 25.9508 22.1546 21.0202 18.4476 17.8600 18.8534 19.3723 22.1903 24.3112 27.6790 (46)
Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)
Total storage loss
23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (56)
If cylinder contains dedicated solar storage
23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (57)
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)
Total heat required for water heating calculated for each month
233.7282 206.7490 219.6004 192.7892 186.7295 168.0757 165.6617 172.2843 174.2408 194.5305 207.1662 231.1218 (62)
WWHRS -26.4771 -23.4166 -24.5205 -20.3039 -18.9225 -16.1921 -15.1775 -16.1398 -16.7530 -19.7500 -22.3743 -25.9868 (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
207.2512 183.3325 195.0799 172.4853 167.8069 151.8836 150.4842 156.1445 157.4878 174.7805 184.7919 205.1350 (64)
Total per year (kWh/year) = Sum(64)m = 2106.6633 (64)
12Total per year (kWh/year) 2107 (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
99.4978 88.4191 94.8003 85.1828 83.8707 76.9656 76.8656 79.0676 79.0155 86.4645 89.9632 98.6311 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	88.5003	97.9825	88.5003	91.4503	88.5003	91.4503	88.5003	88.5003	91.4503	88.5003	91.4503	88.5003	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	175.4617	177.2825	172.6943	162.9265	150.5964	139.0079	131.2661	129.4454	134.0336	143.8013	156.1314	167.7199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	(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)													
	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	(71)
Water heating gains (Table 5)													
	133.7335	131.5761	127.4197	118.3095	112.7294	106.8967	103.3140	106.2737	109.7437	116.2157	124.9489	132.5687	(72)
Total internal gains													
	453.8420	462.9875	444.7607	428.8327	407.9726	390.5014	376.2269	377.3658	388.3741	404.6638	428.6770	444.9353	(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	2.4500	10.6334	0.6300	0.7000	0.7700	7.9618	(74)
East	6.1600	19.6403	0.6300	0.7000	0.7700	36.9743	(76)
South	2.0500	46.7521	0.6300	0.7000	0.7700	29.2905	(78)
West	3.3000	19.6403	0.6300	0.7000	0.7700	19.8077	(80)

Solar gains	94.0342	174.2631	269.8891	377.3826	454.8732	463.8521	442.2363	383.7952	307.6715	201.6552	115.3415	78.6417	(83)
Total gains	547.8762	637.2506	714.6498	806.2153	862.8458	854.3535	818.4631	761.1609	696.0455	606.3190	544.0185	523.5770	(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	59.0839	59.2261	59.3662	60.0330	60.1595	60.7551	60.7551	60.8667	60.5243	60.1595	59.9043	59.6397	
alpha	4.9389	4.9484	4.9577	5.0022	5.0106	5.0503	5.0503	5.0578	5.0350	5.0106	4.9936	4.9760	
util living area													
	0.9862	0.9708	0.9354	0.8387	0.6791	0.4920	0.3572	0.3999	0.6327	0.8876	0.9715	0.9887	(86)
MIT	19.8937	20.1166	20.4120	20.7422	20.9259	20.9880	20.9980	20.9966	20.9604	20.7020	20.2449	19.8571	(87)

Th 2	19.9811	19.9833	19.9854	19.9956	19.9975	20.0063	20.0063	20.0079	20.0029	19.9975	19.9936	19.9896	(88)
util rest of house	0.9821	0.9627	0.9181	0.8012	0.6197	0.4189	0.2772	0.3149	0.5531	0.8510	0.9621	0.9854	(89)
MIT 2	18.7202	19.0008	19.3646	19.7532	19.9407	20.0000	20.0057	20.0068	19.9788	19.7220	19.1730	18.6804	(90)
Living area fraction										fLA = Living area / (4) =		0.4098	(91)
MIT	19.2012	19.4581	19.7939	20.1585	20.3444	20.4049	20.4124	20.4125	20.3811	20.1236	19.6123	19.1626	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2012	19.4581	19.7939	20.1585	20.3444	20.4049	20.4124	20.4125	20.3811	20.1236	19.6123	19.1626	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9781	0.9575	0.9143	0.8078	0.6410	0.4485	0.3101	0.3498	0.5843	0.8562	0.9577	0.9818	(94)
Useful gains	535.8853	610.1630	653.4074	651.2555	553.1032	383.2171	253.7756	266.2360	406.6719	519.1191	521.0031	514.0449	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1021.8852	995.9626	907.3282	759.8773	582.2166	387.1363	254.2541	267.1060	420.4926	641.4314	846.3127	1016.5383	(97)
Space heating kWh	361.5839	259.2573	188.9170	78.2077	21.6604	0.0000	0.0000	0.0000	0.0000	91.0004	234.2229	373.8551	(98a)
Space heating requirement - total per year (kWh/year)												1608.7048	
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	361.5839	259.2573	188.9170	78.2077	21.6604	0.0000	0.0000	0.0000	0.0000	91.0004	234.2229	373.8551	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1608.7048	
Space heating per m2											(98c) / (4) =	26.3722	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	361.5839	259.2573	188.9170	78.2077	21.6604	0.0000	0.0000	0.0000	0.0000	91.0004	234.2229	373.8551	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	391.7486	280.8855	204.6772	84.7321	23.4674	0.0000	0.0000	0.0000	0.0000	98.5919	253.7627	405.0435	(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	207.2512	183.3325	195.0799	172.4853	167.8069	151.8836	150.4842	156.1445	157.4878	174.7805	184.7919	205.1350	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2951	84.8367	83.9878	82.4055	80.7355	79.8000	79.8000	79.8000	79.8000	82.6687	84.5925	85.3880	(217)
Fuel for water heating, kWh/month	242.9813	216.1005	232.2717	209.3128	207.8479	190.3303	188.5767	195.6697	197.3531	211.4228	218.4495	240.2386	(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	18.3886	14.7520	13.2826	9.7314	7.5168	6.1413	6.8571	8.9131	11.5772	15.1899	17.1570	18.8997	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-28.8264	-40.7934	-58.8744	-66.5007	-72.0011	-67.3464	-66.5413	-62.6840	-55.9057	-46.8061	-31.7556	-24.9063	(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	-15.8316	-33.3535	-66.3705	-99.7862	-132.0239	-132.6522	-131.0648	-110.9153	-81.2402	-47.7035	-21.1423	-12.5135	(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												1742.9088	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2550.5549	(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)												148.4066	(232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1507.5389 (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	3020.3314 (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	1742.9088	0.2100	366.0108	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2550.5549	0.2100	535.6165	(264)
Space and water heating			901.6274	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	148.4066	0.1443	21.4197	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-622.9414	0.1345	-83.7764	
PV Unit electricity exported	-884.5975	0.1259	-111.3453	
Total			-195.1217	(269)
Total CO2, kg/year			739.8546	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.1300	(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	1742.9088	1.1300	1969.4869	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2550.5549	1.1300	2882.1271	(278)
Space and water heating			4851.6140	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	148.4066	1.5338	227.6311	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-622.9414	1.4970	-932.5612	
PV Unit electricity exported	-884.5975	0.4620	-408.7133	
Total			-1341.2745	(283)
Total Primary energy kWh/year			3868.0714	(286)
Target Primary Energy Rate (TPER)			63.4100	(287)

Full SAP Calculation Printout

Property Reference	House Type D	Issued on Date	05/10/2023
Assessment Reference	Plot 39	Prop Type Ref	
Property			

SAP Rating	82 B	DER	4.05	TER	9.23
Environmental	96 A	% DER < TER			56.12
CO_2 Emissions (t/year)	0.38	DFEE	28.60	TFEE	32.30
Compliance Check	See BREL	% DFEE < TFEE			11.45
% DPER < TPER	10.70	DPER	42.75	TPER	47.87

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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		51.0000 (1b)	x	2.4000 (2b)	=	122.4000 (1b)	-
First floor		51.0000 (1c)	x	2.4000 (2c)	=	122.4000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	102.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	244.8000	(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	1 * 10 =	10.0000 (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) =	10.0000 / (5) =	0.0408 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2408 (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) =	0.2047 (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	0.2610	0.2559	0.2508	0.2252	0.2201	0.1945	0.1945	0.1894	0.2047	0.2201	0.2303	0.2405	(22b)
Effective ac	0.5341	0.5327	0.5314	0.5254	0.5242	0.5189	0.5189	0.5179	0.5210	0.5242	0.5265	0.5289	(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	
Opening Type 1 (Uw = 1.20)			20.5500	1.1450	23.5305			(27)
Heatloss Floor 1			51.0000	0.1200	6.1200	110.0000	5610.0000	(28a)
External Wall 1	86.4000	20.5500	65.8500	0.1900	12.5115	190.0000	12511.5000	(29a)
External Roof 1	51.0000		51.0000	0.1500	7.6500	9.0000	459.0000	(30)
Total net area of external elements Aum(A, m2)			188.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.8120			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18580.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 182.1618 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	21.0000	0.0670	1.4070
E6 Intermediate floor within a dwelling	21.0000	0.0020	0.0420
E16 Corner (normal)	9.6000	0.0410	0.3936
E18 Party wall between dwellings	9.6000	0.0400	0.3840
E2 Other lintels (including other steel lintels)	16.2500	0.0240	0.3900
E3 Sill	13.0000	0.0190	0.2470
E4 Jamb	39.5000	0.0140	0.5530
E11 Eaves (insulation at rafter level)	10.9000	0.0110	0.1199
E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.9325 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.7445 (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	43.1440	43.0371	42.9324	42.4404	42.3483	41.9198	41.9198	41.8405	42.0849	42.3483	42.5345	42.7292	(38)
Heat transfer coeff	96.8885	96.7817	96.6769	96.1849	96.0929	95.6644	95.6644	95.5850	95.8294	96.0929	96.2791	96.4738	(39)

Average = Sum(39)m / 12 = 96.1845

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9499	0.9488	0.9478	0.9430	0.9421	0.9379	0.9379	0.9371	0.9395	0.9421	0.9439	0.9458	(40)
HLP (average)												0.9430	
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 2.7573 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	70.4504	69.3917	67.8489	64.8970	62.7187	60.2894	58.9085	60.4396	62.1180	64.7264	67.7416	70.1805	(42a)
Hot water usage for baths	30.4192	29.9674	29.3312	28.1582	27.2799	26.3060	25.7799	26.4116	27.0995	28.1416	29.3388	30.3164	(42b)
Hot water usage for other uses	42.8674	41.3085	39.7497	38.1909	36.6321	35.0733	35.0733	36.6321	38.1909	39.7497	41.3085	42.8674	(42c)

Average daily hot water use (litres/day) 132.1266 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.7369	140.6676	136.9299	131.2462	126.6307	121.6686	119.7617	123.4834	127.4084	132.6177	138.3889	143.3642	(44)
Energy conte	227.6442	200.3088	210.4561	179.6695	170.4692	149.6058	144.8414	152.8982	157.1073	179.9610	197.1604	224.4737	(45)

Energy content (annual) Total = Sum(45)m = 2194.5956

Distribution loss (46)m = 0.15 x (45)m	34.1466	30.0463	31.5684	26.9504	25.5704	22.4409	21.7262	22.9347	23.5661	26.9941	29.5741	33.6710	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)

Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	281.0386	248.5360	263.8505	231.3415	223.8636	201.2778	198.2358	206.2926	208.7793	233.3554	248.8324	277.8681	(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	281.0386	248.5360	263.8505	231.3415	223.8636	201.2778	198.2358	206.2926	208.7793	233.3554	248.8324	277.8681	(64)

Total per year (kWh/year) = Sum(64)m = 2823.2716 (64)
12Total per year (kWh/year) 2823 (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	118.4072	105.1844	112.6922	101.0777	99.3965	91.0815	90.8753	93.5542	93.5758	102.5525	106.8934	117.3530	(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	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	131.7222	145.8353	131.7222	136.1130	131.7222	136.1130	131.7222	131.7222	136.1130	131.7222	136.1130	131.7222	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	259.5211	262.2141	255.4278	240.9805	222.7434	205.6032	194.1524	191.4594	198.2457	212.6930	230.9300	248.0703	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	(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)	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	(71)

Water heating gains (Table 5)

	159.1495	156.5245	151.4680	140.3857	133.5975	126.5021	122.1442	125.7449	129.9664	137.8394	148.4631	157.7325 (72)

Total internal gains

	614.7520	628.9332	602.9772	581.8385	552.4224	532.5775	512.3781	513.2857	528.6843	546.6139	579.8654	601.8844 (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	7.7000	10.6334	0.7600	0.7000	0.7700	30.1861 (74)
South	7.8500	46.7521	0.7600	0.7000	0.7700	135.3055 (78)
West	5.0000	19.6403	0.7600	0.7000	0.7700	36.2045 (80)

Solar gains	201.6961	350.1063	496.9345	646.5902	753.0254	760.4091	727.7644	646.2883	548.3783	391.7188	242.7643	171.8538 (83)
Total gains	816.4481	979.0395	1099.9117	1228.4287	1305.4478	1292.9866	1240.1425	1159.5741	1077.0626	938.3327	822.6297	773.7382 (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	53.2700	53.3288	53.3866	53.6597	53.7111	53.9517	53.9517	53.9964	53.8587	53.7111	53.6072	53.4990	
alpha	4.5513	4.5553	4.5591	4.5773	4.5807	4.5968	4.5968	4.5998	4.5906	4.5807	4.5738	4.5666	
util living area	0.9775	0.9516	0.9037	0.7979	0.6413	0.4654	0.3378	0.3765	0.5869	0.8457	0.9554	0.9819	(86)
Living	19.8495	20.1207	20.4275	20.7418	20.9206	20.9852	20.9973	20.9955	20.9591	20.7106	20.2239	19.7907	
Non living	18.7945	19.1331	19.5083	19.8761	20.0648	20.1260	20.1343	20.1341	20.1054	19.8520	19.2697	18.7229	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4114	20.1207	20.4275	20.7418	20.9206	20.9852	20.9973	20.9955	20.9591	20.7106	20.2239	19.9598	(87)
Th 2	20.1253	20.1262	20.1270	20.1311	20.1319	20.1354	20.1354	20.1361	20.1341	20.1319	20.1303	20.1287	(88)
util rest of house	0.9726	0.9419	0.8855	0.7643	0.5922	0.4055	0.2722	0.3070	0.5221	0.8108	0.9448	0.9779	(89)
MIT 2	19.5947	19.1331	19.5083	19.8761	20.0648	20.1260	20.1343	20.1341	20.1054	19.8520	19.2697	18.9762	(90)
Living area fraction										fLA = Living area / (4) =		0.2451	(91)
MIT	19.7949	19.3751	19.7336	20.0883	20.2746	20.3366	20.3458	20.3452	20.3146	20.0624	19.5036	19.2173	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7949	19.3751	19.7336	20.0883	20.2746	20.3366	20.3458	20.3452	20.3146	20.0624	19.5036	19.2173	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9705	0.9318	0.8761	0.7625	0.6005	0.4196	0.2883	0.3240	0.5360	0.8077	0.9353	0.9726	(94)
Useful gains	792.3437	912.2802	963.6340	936.7025	783.9705	542.5909	357.4921	375.6510	577.3400	757.8563	769.4311	752.5361	(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	1501.2791	1400.9282	1279.3874	1076.1464	823.9550	548.7886	358.3396	377.1048	595.5417	909.2704	1194.2044	1448.7752	(97)
Space heating kWh	527.4480	328.3714	234.9205	100.3996	29.7484	0.0000	0.0000	0.0000	0.0000	112.6521	305.8368	518.0019	(98a)
Space heating requirement - total per year (kWh/year)												2157.3788	
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	527.4480	328.3714	234.9205	100.3996	29.7484	0.0000	0.0000	0.0000	0.0000	112.6521	305.8368	518.0019	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2157.3788	
Space heating per m2										(98c) / (4) =		21.1508	(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 %) 254.0218 (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	527.4480	328.3714	234.9205	100.3996	29.7484	0.0000	0.0000	0.0000	0.0000	112.6521	305.8368	518.0019	(98)
Space heating efficiency (main heating system 1)	254.0218	254.0218	254.0218	254.0218	254.0218	0.0000	0.0000	0.0000	0.0000	254.0218	254.0218	254.0218	(210)
Space heating fuel (main heating system)	207.6389	129.2690	92.4805	39.5240	11.7110	0.0000	0.0000	0.0000	0.0000	44.3474	120.3979	203.9203	(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												
	281.0386	248.5360	263.8505	231.3415	223.8636	201.2778	198.2358	206.2926	208.7793	233.3554	248.8324	277.8681 (64)
Efficiency of water heater												166.3877 (216)
(217)m	166.3877	166.3877	166.3877	166.3877	166.3877	166.3877	166.3877	166.3877	166.3877	166.3877	166.3877	166.3877 (217)
Fuel for water heating, kWh/month												
	168.9058	149.3716	158.5757	139.0376	134.5433	120.9691	119.1409	123.9831	125.4776	140.2479	149.5497	167.0003 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	35.2511	28.2798	25.4628	18.6551	14.4098	11.7729	13.1451	17.0864	22.1936	29.1192	32.8901	36.2309 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	849.2889 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	166.3877
Water heating fuel used	1696.8026 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	284.4967 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	2830.5882 (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	849.2889	0.1570	133.3258	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1696.8026	0.1409	239.1474	(264)
Space and water heating			372.4732	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	284.4967	0.1443	41.0617	(268)
Total CO2, kg/year			413.5348	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0500	(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	849.2889	1.5811	1342.8248	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1696.8026	1.5211	2581.0862	(278)
Space and water heating			3923.9111	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	284.4967	1.5338	436.3705	(282)
Total Primary energy kWh/year			4360.2816	(286)
Dwelling Primary energy Rate (DPER)			42.7500	(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	51.0000 (1b)	x	2.4000 (2b)	=	122.4000 (1b)	-
First floor	51.0000 (1c)	x	2.4000 (2c)	=	122.4000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	102.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	244.8000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1634 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4134 (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) =	0.3514 (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	0.4480	0.4392	0.4305	0.3865	0.3777	0.3338	0.3338	0.3250	0.3514	0.3777	0.3953	0.4129	(22b)
Effective ac	0.6004	0.5965	0.5926	0.5747	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852	(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 Opening Type (Uw = 1.20)			20.5500	1.1450	23.5305			(27)
Heatloss Floor 1			51.0000	0.1300	6.6300			(28a)
External Wall 1	86.4000	20.5500	65.8500	0.1800	11.8530			(29a)
External Roof 1	51.0000		51.0000	0.1100	5.6100			(30)
Total net area of external elements Aum(A, m2)			188.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.6235			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 182.1618 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	21.0000	0.1600	3.3600
E6 Intermediate floor within a dwelling	21.0000	0.0000	0.0000
E16 Corner (normal)	9.6000	0.0900	0.8640
E18 Party wall between dwellings	9.6000	0.0600	0.5760
E2 Other lintels (including other steel lintels)	16.2500	0.0500	0.8125
E3 Sill	13.0000	0.0500	0.6500
E4 Jamb	39.5000	0.0500	1.9750
E11 Eaves (insulation at rafter level)	10.9000	0.0400	0.4360
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.3935 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	57.0170 (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	48.4996	48.1848	47.8762	46.4267	46.1555	44.8931	44.8931	44.6593	45.3794	46.1555	46.7041	47.2777	(38)
Heat transfer coeff	105.5166	105.2018	104.8932	103.4437	103.1726	101.9101	101.9101	101.6764	102.3964	103.1726	103.7212	104.2947	(39)
Average = Sum(39)m / 12 =												103.4425	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0345	1.0314	1.0284	1.0142	1.0115	0.9991	0.9991	0.9968	1.0039	1.0115	1.0169	1.0225	(40)
HLP (average)												1.0141	
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													2.7573 (42)
Hot water usage for mixer showers													
	70.4504	69.3917	67.8489	64.8970	62.7187	60.2894	58.9085	60.4396	62.1180	64.7264	67.7416	70.1805	(42a)
Hot water usage for baths													
	30.4192	29.9674	29.3312	28.1582	27.2799	26.3060	25.7799	26.4116	27.0995	28.1416	29.3388	30.3164	(42b)
Hot water usage for other uses													
	42.8674	41.3085	39.7497	38.1909	36.6321	35.0733	35.0733	36.6321	38.1909	39.7497	41.3085	42.8674	(42c)
Average daily hot water use (litres/day)												132.1266	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	143.7369	140.6676	136.9299	131.2462	126.6307	121.6686	119.7617	123.4834	127.4084	132.6177	138.3889	143.3642	(44)
Energy conte	227.6442	200.3088	210.4561	179.6695	170.4692	149.6058	144.8414	152.8982	157.1073	179.9610	197.1604	224.4737	(45)
Energy content (annual)										Total = Sum(45)m =		2194.5956	
Distribution loss (46)m = 0.15 x (45)m													
	34.1466	30.0463	31.5684	26.9504	25.5704	22.4409	21.7262	22.9347	23.5661	26.9941	29.5741	33.6710	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	274.2391	242.3946	257.0510	224.7613	217.0641	194.6976	191.4363	199.4931	202.1992	226.5559	242.2522	271.0686	(62)
WWHRS	-32.2070	-28.4841	-29.8269	-24.6979	-23.0175	-19.6963	-18.4621	-19.6326	-20.3785	-24.0240	-27.2163	-31.6106	(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													
	242.0321	213.9104	227.2241	200.0635	194.0466	175.0013	172.9742	179.8605	181.8206	202.5319	215.0359	239.4580	(64)
										Total per year (kWh/year) = Sum(64)m =		2443.9592	(64)
12Total per year (kWh/year)												2444	(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													
	112.9676	100.2713	107.2526	95.8136	93.9569	85.8174	85.4357	88.1146	88.3117	97.1129	101.6293	111.9134	(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	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	131.7222	145.8353	131.7222	136.1130	131.7222	136.1130	131.7222	131.7222	136.1130	131.7222	136.1130	131.7222	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	259.5211	262.2141	255.4278	240.9805	222.7434	205.6032	194.1524	191.4594	198.2457	212.6930	230.9300	248.0703	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	(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)													
	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	(71)
Water heating gains (Table 5)													
	151.8382	149.2132	144.1567	133.0744	126.2862	119.1908	114.8329	118.4336	122.6551	130.5282	141.1518	150.4213	(72)
Total internal gains													
	610.4408	624.6219	598.6660	577.5272	548.1111	525.2662	505.0668	505.9745	521.3730	542.3026	575.5541	597.5731	(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	7.7000	10.6334	0.6300	0.7000	0.7700	25.0227	(74)
South	7.8500	46.7521	0.6300	0.7000	0.7700	112.1611	(78)
West	5.0000	19.6403	0.6300	0.7000	0.7700	30.0116	(80)

Solar gains	167.1954	290.2197	411.9325	535.9893	624.2184	630.3391	603.2784	535.7390	454.5767	324.7143	201.2388	142.4578	(83)
Total gains	777.6362	914.8416	1010.5985	1113.5164	1172.3295	1155.6053	1108.3452	1041.7135	975.9497	867.0169	776.7929	740.0308	(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	48.9141	49.0605	49.2048	49.8943	50.0254	50.6451	50.6451	50.7616	50.4046	50.0254	49.7608	49.4872	
alpha	4.2609	4.2707	4.2803	4.3263	4.3350	4.3763	4.3763	4.3841	4.3603	4.3350	4.3174	4.2991	
util living area													
	0.9826	0.9655	0.9341	0.8565	0.7235	0.5433	0.3999	0.4415	0.6646	0.8878	0.9668	0.9856	(86)
MIT	19.6280	19.8850	20.2056	20.5883	20.8461	20.9662	20.9929	20.9892	20.9198	20.5808	20.0464	19.5899	(87)
Th 2	20.0547	20.0573	20.0598	20.0716	20.0738	20.0841	20.0841	20.0860	20.0801	20.0738	20.0693	20.0646	(88)
util rest of house													
	0.9787	0.9580	0.9198	0.8270	0.6727	0.4730	0.3189	0.3572	0.5941	0.8578	0.9583	0.9824	(89)
MIT 2	18.4647	18.7895	19.1891	19.6554	19.9402	20.0623	20.0811	20.0811	20.0222	19.6592	19.0049	18.4235	(90)
Living area fraction										fLA = Living area / (4) =		0.2451	(91)
MIT	18.7498	19.0580	19.4382	19.8841	20.1622	20.2838	20.3046	20.3037	20.2422	19.8851	19.2602	18.7094	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7498	19.0580	19.4382	19.8841	20.1622	20.2838	20.3046	20.3037	20.2422	19.8851	19.2602	18.7094	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9714	0.9479	0.9084	0.8204	0.6779	0.4888	0.3386	0.3776	0.6072	0.8507	0.9487	0.9759	(94)
Useful gains	755.3631	867.1664	918.0326	913.4861	794.6947	564.8245	375.2938	393.3184	592.5660	737.5810	736.9580	722.1667	(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													
	1524.6957	1489.4435	1357.1339	1136.2354	873.0720	579.2384	377.5352	396.9127	628.9398	957.9668	1261.2709	1513.2541	(97)
Space heating kWh													
	572.3834	418.1702	326.6914	160.3795	58.3127	0.0000	0.0000	0.0000	0.0000	163.9671	377.5053	588.5690	(98a)
Space heating requirement - total per year (kWh/year)												2665.9786	
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													
	572.3834	418.1702	326.6914	160.3795	58.3127	0.0000	0.0000	0.0000	0.0000	163.9671	377.5053	588.5690	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2665.9786	
Space heating per m2											(98c) / (4) =	26.1370	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	572.3834	418.1702	326.6914	160.3795	58.3127	0.0000	0.0000	0.0000	0.0000	163.9671	377.5053	588.5690	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	620.1337	453.0554	353.9452	173.7589	63.1774	0.0000	0.0000	0.0000	0.0000	177.6458	408.9982	637.6696	(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													
	242.0321	213.9104	227.2241	200.0635	194.0466	175.0013	172.9742	179.8605	181.8206	202.5319	215.0359	239.4580	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9202	85.5353	84.8734	83.5686	81.7137	79.8000	79.8000	79.8000	79.8000	83.5903	85.3084	85.9952	(217)
Fuel for water heating, kWh/month													
	281.6941	250.0844	267.7213	239.4001	237.4714	219.2999	216.7597	225.3891	227.8454	242.2912	252.0689	278.4550	(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	27.3693	21.9566	19.7695	14.4840	11.1879	9.1406	10.2059	13.2661	17.2313	22.6084	25.5362	28.1300	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-46.5493	-65.0392	-92.6555	-103.2037	-110.4417	-102.7400	-101.4109	-96.1069	-86.6807	-73.8475	-50.9426	-40.3088	(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	-28.1247	-58.9441	-116.7704	-174.8498	-230.7148	-231.6839	-229.0124	-194.1740	-142.6451	-84.1850	-37.5096	-22.2621	(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												2888.3842	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	79.8000
Water heating fuel used	2938.4806 (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)	220.8857 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2520.8028 (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	3612.9477 (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	2888.3842	0.2100	606.5607	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2938.4806	0.2100	617.0809	(264)
Space and water heating			1223.6416	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	220.8857	0.1443	31.8806	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-969.9269	0.1348	-130.7369	
PV Unit electricity exported	-1550.8758	0.1260	-195.3799	
Total			-326.1168	(269)
Total CO2, kg/year			941.3347	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2300	(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	2888.3842	1.1300	3263.8741	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2938.4806	1.1300	3320.4831	(278)
Space and water heating			6584.3572	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	220.8857	1.5338	338.8019	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-969.9269	1.4982	-1453.1196	
PV Unit electricity exported	-1550.8758	0.4624	-717.1840	
Total			-2170.3036	(283)
Total Primary energy kWh/year			4882.9563	(286)
Target Primary Energy Rate (TPER)			47.8700	(287)

Full SAP Calculation Printout

Property Reference	House Type D	Issued on Date	05/10/2023
Assessment Reference	Plot 40	Prop Type Ref	
Property			

SAP Rating	82 B	DER	4.05	TER	9.23
Environmental	96 A	% DER < TER			56.12
CO_2 Emissions (t/year)	0.38	DFEE	28.60	TFEE	32.30
Compliance Check	See BREL	% DFEE < TFEE			11.45
% DPER < TPER	10.70	DPER	42.75	TPER	47.87

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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			51.0000 (1b)	x	2.4000 (2b)	=	122.4000 (1b)	-
First floor			51.0000 (1c)	x	2.4000 (2c)	=	122.4000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	102.0000							(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	244.8000	(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		1 * 10	=	10.0000 (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) =		10.0000 / (5)	=	0.0408 (8)
Pressure test				Yes
Pressure Test Method				Blower Door
Measured/design AP50				4.0000 (17)
Infiltration rate				0.2408 (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)	=	0.2047 (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	0.2610	0.2559	0.2508	0.2252	0.2201	0.1945	0.1945	0.1894	0.2047	0.2201	0.2303	0.2405	(22b)
Effective ac	0.5341	0.5327	0.5314	0.5254	0.5242	0.5189	0.5189	0.5179	0.5210	0.5242	0.5265	0.5289	(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	
Opening Type 1 (Uw = 1.20)			20.5500	1.1450	23.5305			(27)
Heatloss Floor 1			51.0000	0.1200	6.1200	110.0000	5610.0000	(28a)
External Wall 1	86.4000	20.5500	65.8500	0.1900	12.5115	190.0000	12511.5000	(29a)
External Roof 1	51.0000		51.0000	0.1500	7.6500	9.0000	459.0000	(30)
Total net area of external elements Aum(A, m2)			188.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.8120			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18580.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 182.1618 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	21.0000	0.0670	1.4070
E6 Intermediate floor within a dwelling	21.0000	0.0020	0.0420
E16 Corner (normal)	9.6000	0.0410	0.3936
E18 Party wall between dwellings	9.6000	0.0400	0.3840
E2 Other lintels (including other steel lintels)	16.2500	0.0240	0.3900
E3 Sill	13.0000	0.0190	0.2470
E4 Jamb	39.5000	0.0140	0.5530
E11 Eaves (insulation at rafter level)	10.9000	0.0110	0.1199
E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.9325 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.7445 (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	43.1440	43.0371	42.9324	42.4404	42.3483	41.9198	41.9198	41.8405	42.0849	42.3483	42.5345	42.7292	(38)
Heat transfer coeff	96.8885	96.7817	96.6769	96.1849	96.0929	95.6644	95.6644	95.5850	95.8294	96.0929	96.2791	96.4738	(39)

Average = Sum(39)m / 12 = 96.1845

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9499	0.9488	0.9478	0.9430	0.9421	0.9379	0.9379	0.9371	0.9395	0.9421	0.9439	0.9458	(40)
HLP (average)												0.9430	
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 2.7573 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	70.4504	69.3917	67.8489	64.8970	62.7187	60.2894	58.9085	60.4396	62.1180	64.7264	67.7416	70.1805	(42a)
Hot water usage for baths	30.4192	29.9674	29.3312	28.1582	27.2799	26.3060	25.7799	26.4116	27.0995	28.1416	29.3388	30.3164	(42b)
Hot water usage for other uses	42.8674	41.3085	39.7497	38.1909	36.6321	35.0733	35.0733	36.6321	38.1909	39.7497	41.3085	42.8674	(42c)

Average daily hot water use (litres/day) 132.1266 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.7369	140.6676	136.9299	131.2462	126.6307	121.6686	119.7617	123.4834	127.4084	132.6177	138.3889	143.3642	(44)
Energy conte	227.6442	200.3088	210.4561	179.6695	170.4692	149.6058	144.8414	152.8982	157.1073	179.9610	197.1604	224.4737	(45)

Energy content (annual) Total = Sum(45)m = 2194.5956

Distribution loss (46)m = 0.15 x (45)m	34.1466	30.0463	31.5684	26.9504	25.5704	22.4409	21.7262	22.9347	23.5661	26.9941	29.5741	33.6710	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)

Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	281.0386	248.5360	263.8505	231.3415	223.8636	201.2778	198.2358	206.2926	208.7793	233.3554	248.8324	277.8681	(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	281.0386	248.5360	263.8505	231.3415	223.8636	201.2778	198.2358	206.2926	208.7793	233.3554	248.8324	277.8681	(64)

Total per year (kWh/year) = Sum(64)m = 2823.2716 (64)
12Total per year (kWh/year) 2823 (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	118.4072	105.1844	112.6922	101.0777	99.3965	91.0815	90.8753	93.5542	93.5758	102.5525	106.8934	117.3530	(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	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	131.7222	145.8353	131.7222	136.1130	131.7222	136.1130	131.7222	131.7222	136.1130	131.7222	136.1130	131.7222	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	259.5211	262.2141	255.4278	240.9805	222.7434	205.6032	194.1524	191.4594	198.2457	212.6930	230.9300	248.0703	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	(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)	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	(71)

Water heating gains (Table 5)

	159.1495	156.5245	151.4680	140.3857	133.5975	126.5021	122.1442	125.7449	129.9664	137.8394	148.4631	157.7325 (72)

Total internal gains

	614.7520	628.9332	602.9772	581.8385	552.4224	532.5775	512.3781	513.2857	528.6843	546.6139	579.8654	601.8844 (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	7.7000	10.6334	0.7600	0.7000	0.7700	30.1861 (74)
South	7.8500	46.7521	0.7600	0.7000	0.7700	135.3055 (78)
West	5.0000	19.6403	0.7600	0.7000	0.7700	36.2045 (80)

Solar gains	201.6961	350.1063	496.9345	646.5902	753.0254	760.4091	727.7644	646.2883	548.3783	391.7188	242.7643	171.8538 (83)
Total gains	816.4481	979.0395	1099.9117	1228.4287	1305.4478	1292.9866	1240.1425	1159.5741	1077.0626	938.3327	822.6297	773.7382 (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	53.2700	53.3288	53.3866	53.6597	53.7111	53.9517	53.9517	53.9964	53.8587	53.7111	53.6072	53.4990	
alpha	4.5513	4.5553	4.5591	4.5773	4.5807	4.5968	4.5968	4.5998	4.5906	4.5807	4.5738	4.5666	
util living area	0.9775	0.9516	0.9037	0.7979	0.6413	0.4654	0.3378	0.3765	0.5869	0.8457	0.9554	0.9819	(86)
Living	19.8495	20.1207	20.4275	20.7418	20.9206	20.9852	20.9973	20.9955	20.9591	20.7106	20.2239	19.7907	
Non living	18.7945	19.1331	19.5083	19.8761	20.0648	20.1260	20.1343	20.1341	20.1054	19.8520	19.2697	18.7229	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4114	20.1207	20.4275	20.7418	20.9206	20.9852	20.9973	20.9955	20.9591	20.7106	20.2239	19.9598	(87)
Th 2	20.1253	20.1262	20.1270	20.1311	20.1319	20.1354	20.1354	20.1361	20.1341	20.1319	20.1303	20.1287	(88)
util rest of house	0.9726	0.9419	0.8855	0.7643	0.5922	0.4055	0.2722	0.3070	0.5221	0.8108	0.9448	0.9779	(89)
MIT 2	19.5947	19.1331	19.5083	19.8761	20.0648	20.1260	20.1343	20.1341	20.1054	19.8520	19.2697	18.9762	(90)
Living area fraction										fLA = Living area / (4) =		0.2451	(91)
MIT	19.7949	19.3751	19.7336	20.0883	20.2746	20.3366	20.3458	20.3452	20.3146	20.0624	19.5036	19.2173	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7949	19.3751	19.7336	20.0883	20.2746	20.3366	20.3458	20.3452	20.3146	20.0624	19.5036	19.2173	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9705	0.9318	0.8761	0.7625	0.6005	0.4196	0.2883	0.3240	0.5360	0.8077	0.9353	0.9726	(94)
Useful gains	792.3437	912.2802	963.6340	936.7025	783.9705	542.5909	357.4921	375.6510	577.3400	757.8563	769.4311	752.5361	(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	1501.2791	1400.9282	1279.3874	1076.1464	823.9550	548.7886	358.3396	377.1048	595.5417	909.2704	1194.2044	1448.7752	(97)
Space heating kWh	527.4480	328.3714	234.9205	100.3996	29.7484	0.0000	0.0000	0.0000	0.0000	112.6521	305.8368	518.0019	(98a)
Space heating requirement - total per year (kWh/year)												2157.3788	
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	527.4480	328.3714	234.9205	100.3996	29.7484	0.0000	0.0000	0.0000	0.0000	112.6521	305.8368	518.0019	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2157.3788	
Space heating per m2										(98c) / (4) =		21.1508	(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 %) 254.0218 (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	527.4480	328.3714	234.9205	100.3996	29.7484	0.0000	0.0000	0.0000	0.0000	112.6521	305.8368	518.0019	(98)
Space heating efficiency (main heating system 1)	254.0218	254.0218	254.0218	254.0218	254.0218	0.0000	0.0000	0.0000	0.0000	254.0218	254.0218	254.0218	(210)
Space heating fuel (main heating system)	207.6389	129.2690	92.4805	39.5240	11.7110	0.0000	0.0000	0.0000	0.0000	44.3474	120.3979	203.9203	(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												
	281.0386	248.5360	263.8505	231.3415	223.8636	201.2778	198.2358	206.2926	208.7793	233.3554	248.8324	277.8681 (64)
Efficiency of water heater												166.3877 (216)
(217)m	166.3877	166.3877	166.3877	166.3877	166.3877	166.3877	166.3877	166.3877	166.3877	166.3877	166.3877	166.3877 (217)
Fuel for water heating, kWh/month												
	168.9058	149.3716	158.5757	139.0376	134.5433	120.9691	119.1409	123.9831	125.4776	140.2479	149.5497	167.0003 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	35.2511	28.2798	25.4628	18.6551	14.4098	11.7729	13.1451	17.0864	22.1936	29.1192	32.8901	36.2309 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	849.2889 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	166.3877
Water heating fuel used	1696.8026 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	284.4967 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	2830.5882 (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	849.2889	0.1570	133.3258	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1696.8026	0.1409	239.1474	(264)
Space and water heating			372.4732	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	284.4967	0.1443	41.0617	(268)
Total CO2, kg/year			413.5348	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0500	(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	849.2889	1.5811	1342.8248	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1696.8026	1.5211	2581.0862	(278)
Space and water heating			3923.9111	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	284.4967	1.5338	436.3705	(282)
Total Primary energy kWh/year			4360.2816	(286)
Dwelling Primary energy Rate (DPER)			42.7500	(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	51.0000 (1b)	x	2.4000 (2b)	=	122.4000 (1b)	-
First floor	51.0000 (1c)	x	2.4000 (2c)	=	122.4000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	102.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	244.8000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1634 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4134 (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) =	0.3514 (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	0.4480	0.4392	0.4305	0.3865	0.3777	0.3338	0.3338	0.3250	0.3514	0.3777	0.3953	0.4129	(22b)
Effective ac	0.6004	0.5965	0.5926	0.5747	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852	(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 Opening Type (Uw = 1.20)			20.5500	1.1450	23.5305			(27)
Heatloss Floor 1			51.0000	0.1300	6.6300			(28a)
External Wall 1	86.4000	20.5500	65.8500	0.1800	11.8530			(29a)
External Roof 1	51.0000		51.0000	0.1100	5.6100			(30)
Total net area of external elements Aum(A, m2)			188.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.6235			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 182.1618 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	21.0000	0.1600	3.3600
E6 Intermediate floor within a dwelling	21.0000	0.0000	0.0000
E16 Corner (normal)	9.6000	0.0900	0.8640
E18 Party wall between dwellings	9.6000	0.0600	0.5760
E2 Other lintels (including other steel lintels)	16.2500	0.0500	0.8125
E3 Sill	13.0000	0.0500	0.6500
E4 Jamb	39.5000	0.0500	1.9750
E11 Eaves (insulation at rafter level)	10.9000	0.0400	0.4360
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.3935 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	57.0170 (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	48.4996	48.1848	47.8762	46.4267	46.1555	44.8931	44.8931	44.6593	45.3794	46.1555	46.7041	47.2777	(38)
Heat transfer coeff	105.5166	105.2018	104.8932	103.4437	103.1726	101.9101	101.9101	101.6764	102.3964	103.1726	103.7212	104.2947	(39)
Average = Sum(39)m / 12 =												103.4425	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0345	1.0314	1.0284	1.0142	1.0115	0.9991	0.9991	0.9968	1.0039	1.0115	1.0169	1.0225	(40)
HLP (average)												1.0141	
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													2.7573 (42)
Hot water usage for mixer showers													
	70.4504	69.3917	67.8489	64.8970	62.7187	60.2894	58.9085	60.4396	62.1180	64.7264	67.7416	70.1805	(42a)
Hot water usage for baths													
	30.4192	29.9674	29.3312	28.1582	27.2799	26.3060	25.7799	26.4116	27.0995	28.1416	29.3388	30.3164	(42b)
Hot water usage for other uses													
	42.8674	41.3085	39.7497	38.1909	36.6321	35.0733	35.0733	36.6321	38.1909	39.7497	41.3085	42.8674	(42c)
Average daily hot water use (litres/day)												132.1266	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	143.7369	140.6676	136.9299	131.2462	126.6307	121.6686	119.7617	123.4834	127.4084	132.6177	138.3889	143.3642	(44)
Energy conte	227.6442	200.3088	210.4561	179.6695	170.4692	149.6058	144.8414	152.8982	157.1073	179.9610	197.1604	224.4737	(45)
Energy content (annual)										Total = Sum(45)m =		2194.5956	
Distribution loss (46)m = 0.15 x (45)m													
	34.1466	30.0463	31.5684	26.9504	25.5704	22.4409	21.7262	22.9347	23.5661	26.9941	29.5741	33.6710	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	274.2391	242.3946	257.0510	224.7613	217.0641	194.6976	191.4363	199.4931	202.1992	226.5559	242.2522	271.0686	(62)
WWHRS	-32.2070	-28.4841	-29.8269	-24.6979	-23.0175	-19.6963	-18.4621	-19.6326	-20.3785	-24.0240	-27.2163	-31.6106	(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													
	242.0321	213.9104	227.2241	200.0635	194.0466	175.0013	172.9742	179.8605	181.8206	202.5319	215.0359	239.4580	(64)
										Total per year (kWh/year) = Sum(64)m =		2443.9592	(64)
12Total per year (kWh/year)												2444	(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													
	112.9676	100.2713	107.2526	95.8136	93.9569	85.8174	85.4357	88.1146	88.3117	97.1129	101.6293	111.9134	(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	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	131.7222	145.8353	131.7222	136.1130	131.7222	136.1130	131.7222	131.7222	136.1130	131.7222	136.1130	131.7222	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	259.5211	262.2141	255.4278	240.9805	222.7434	205.6032	194.1524	191.4594	198.2457	212.6930	230.9300	248.0703	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	(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)													
	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	(71)
Water heating gains (Table 5)													
	151.8382	149.2132	144.1567	133.0744	126.2862	119.1908	114.8329	118.4336	122.6551	130.5282	141.1518	150.4213	(72)
Total internal gains													
	610.4408	624.6219	598.6660	577.5272	548.1111	525.2662	505.0668	505.9745	521.3730	542.3026	575.5541	597.5731	(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	7.7000	10.6334	0.6300	0.7000	0.7700	25.0227	(74)
South	7.8500	46.7521	0.6300	0.7000	0.7700	112.1611	(78)
West	5.0000	19.6403	0.6300	0.7000	0.7700	30.0116	(80)

Solar gains	167.1954	290.2197	411.9325	535.9893	624.2184	630.3391	603.2784	535.7390	454.5767	324.7143	201.2388	142.4578	(83)
Total gains	777.6362	914.8416	1010.5985	1113.5164	1172.3295	1155.6053	1108.3452	1041.7135	975.9497	867.0169	776.7929	740.0308	(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	48.9141	49.0605	49.2048	49.8943	50.0254	50.6451	50.6451	50.7616	50.4046	50.0254	49.7608	49.4872	
alpha	4.2609	4.2707	4.2803	4.3263	4.3350	4.3763	4.3763	4.3841	4.3603	4.3350	4.3174	4.2991	
util living area													
	0.9826	0.9655	0.9341	0.8565	0.7235	0.5433	0.3999	0.4415	0.6646	0.8878	0.9668	0.9856	(86)
MIT	19.6280	19.8850	20.2056	20.5883	20.8461	20.9662	20.9929	20.9892	20.9198	20.5808	20.0464	19.5899	(87)
Th 2	20.0547	20.0573	20.0598	20.0716	20.0738	20.0841	20.0841	20.0860	20.0801	20.0738	20.0693	20.0646	(88)
util rest of house													
	0.9787	0.9580	0.9198	0.8270	0.6727	0.4730	0.3189	0.3572	0.5941	0.8578	0.9583	0.9824	(89)
MIT 2	18.4647	18.7895	19.1891	19.6554	19.9402	20.0623	20.0811	20.0811	20.0222	19.6592	19.0049	18.4235	(90)
Living area fraction										fLA = Living area / (4) =		0.2451	(91)
MIT	18.7498	19.0580	19.4382	19.8841	20.1622	20.2838	20.3046	20.3037	20.2422	19.8851	19.2602	18.7094	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7498	19.0580	19.4382	19.8841	20.1622	20.2838	20.3046	20.3037	20.2422	19.8851	19.2602	18.7094	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9714	0.9479	0.9084	0.8204	0.6779	0.4888	0.3386	0.3776	0.6072	0.8507	0.9487	0.9759	(94)
Useful gains	755.3631	867.1664	918.0326	913.4861	794.6947	564.8245	375.2938	393.3184	592.5660	737.5810	736.9580	722.1667	(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													
	1524.6957	1489.4435	1357.1339	1136.2354	873.0720	579.2384	377.5352	396.9127	628.9398	957.9668	1261.2709	1513.2541	(97)
Space heating kWh													
	572.3834	418.1702	326.6914	160.3795	58.3127	0.0000	0.0000	0.0000	0.0000	163.9671	377.5053	588.5690	(98a)
Space heating requirement - total per year (kWh/year)												2665.9786	
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													
	572.3834	418.1702	326.6914	160.3795	58.3127	0.0000	0.0000	0.0000	0.0000	163.9671	377.5053	588.5690	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2665.9786	
Space heating per m2											(98c) / (4) =	26.1370	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	572.3834	418.1702	326.6914	160.3795	58.3127	0.0000	0.0000	0.0000	0.0000	163.9671	377.5053	588.5690	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	620.1337	453.0554	353.9452	173.7589	63.1774	0.0000	0.0000	0.0000	0.0000	177.6458	408.9982	637.6696	(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													
	242.0321	213.9104	227.2241	200.0635	194.0466	175.0013	172.9742	179.8605	181.8206	202.5319	215.0359	239.4580	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9202	85.5353	84.8734	83.5686	81.7137	79.8000	79.8000	79.8000	79.8000	83.5903	85.3084	85.9952	(217)
Fuel for water heating, kWh/month													
	281.6941	250.0844	267.7213	239.4001	237.4714	219.2999	216.7597	225.3891	227.8454	242.2912	252.0689	278.4550	(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	27.3693	21.9566	19.7695	14.4840	11.1879	9.1406	10.2059	13.2661	17.2313	22.6084	25.5362	28.1300	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-46.5493	-65.0392	-92.6555	-103.2037	-110.4417	-102.7400	-101.4109	-96.1069	-86.6807	-73.8475	-50.9426	-40.3088	(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	-28.1247	-58.9441	-116.7704	-174.8498	-230.7148	-231.6839	-229.0124	-194.1740	-142.6451	-84.1850	-37.5096	-22.2621	(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												2888.3842	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	79.8000
Water heating fuel used	2938.4806 (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)	220.8857 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2520.8028 (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	3612.9477 (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	2888.3842	0.2100	606.5607	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2938.4806	0.2100	617.0809	(264)
Space and water heating			1223.6416	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	220.8857	0.1443	31.8806	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-969.9269	0.1348	-130.7369	
PV Unit electricity exported	-1550.8758	0.1260	-195.3799	
Total			-326.1168	(269)
Total CO2, kg/year			941.3347	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2300	(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	2888.3842	1.1300	3263.8741	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2938.4806	1.1300	3320.4831	(278)
Space and water heating			6584.3572	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	220.8857	1.5338	338.8019	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-969.9269	1.4982	-1453.1196	
PV Unit electricity exported	-1550.8758	0.4624	-717.1840	
Total			-2170.3036	(283)
Total Primary energy kWh/year			4882.9563	(286)
Target Primary Energy Rate (TPER)			47.8700	(287)

Full SAP Calculation Printout

Property Reference	House Type D	Issued on Date	05/10/2023
Assessment Reference	Plot 41	Prop Type Ref	
Property			

SAP Rating	82 B	DER	4.51	TER	10.39
Environmental	96 A	% DER < TER			56.59
CO_2 Emissions (t/year)	0.32	DFEE	27.55	TFEE	30.77
Compliance Check	See BREL	% DFEE < TFEE			10.45
% DPER < TPER	11.85	DPER	47.70	TPER	54.11

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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		38.0000 (1b)	x	2.4000 (2b)	=	91.2000 (1b)	-
First floor		38.0000 (1c)	x	2.4000 (2c)	=	91.2000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.4000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0548	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2548	(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) =	0.2166	(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	0.2762	0.2708	0.2653	0.2383	0.2328	0.2058	0.2058	0.2004	0.2166	0.2328	0.2437	0.2545	(22b)
Effective ac	0.5381	0.5367	0.5352	0.5284	0.5271	0.5212	0.5212	0.5201	0.5235	0.5271	0.5297	0.5324	(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	
Opening Type 1 (Uw = 1.20)			11.4500	1.1450	13.1107			(27)
Heatloss Floor 1			38.0000	0.1200	4.5600	110.0000	4180.0000	(28a)
External Wall 1	86.4000	11.4500	74.9500	0.1900	14.2405	190.0000	14240.5000	(29a)
External Roof 1	38.0000		38.0000	0.1500	5.7000	9.0000	342.0000	(30)
Total net area of external elements Aum(A, m2)			162.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.6112			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18762.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 246.8750 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	18.0000	0.0670	1.2060
E6 Intermediate floor within a dwelling	18.0000	0.0020	0.0360
E16 Corner (normal)	9.6000	0.0410	0.3936
E18 Party wall between dwellings	9.6000	0.0400	0.3840
E2 Other lintels (including other steel lintels)	5.2000	0.0240	0.1248
E3 Sill	3.4500	0.0190	0.0655
E4 Jamb	8.9000	0.0140	0.1246
E11 Eaves (insulation at rafter level)	8.2000	0.0110	0.0902
E12 Gable (insulation at ceiling level)	10.0000	0.0330	0.3300

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.7548 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.3659 (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	32.3914	32.3022	32.2149	31.8045	31.7277	31.3703	31.3703	31.3041	31.5080	31.7277	31.8830	32.0454	(38)
Heat transfer coeff	72.7573	72.6682	72.5808	72.1704	72.0937	71.7363	71.7363	71.6701	71.8739	72.0937	72.2490	72.4114	(39)

Average = Sum(39)m / 12 = 72.1701

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9573	0.9562	0.9550	0.9496	0.9486	0.9439	0.9439	0.9430	0.9457	0.9486	0.9506	0.9528	(40)
HLP (average)												0.9496	
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 2.3826 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	64.1678	63.2035	61.7983	59.1097	57.1256	54.9129	53.6553	55.0498	56.5785	58.9543	61.7006	63.9220	(42a)
Hot water usage for baths	27.7175	27.3058	26.7262	25.6573	24.8570	23.9696	23.4902	24.0659	24.6926	25.6422	26.7330	27.6238	(42b)
Hot water usage for other uses	39.0301	37.6108	36.1915	34.7722	33.3530	31.9337	31.9337	33.3530	34.7722	36.1915	37.6108	39.0301	(42c)

Average daily hot water use (litres/day) 120.3410 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.9154	128.1202	124.7160	119.5393	115.3356	110.8162	109.0792	112.4686	116.0434	120.7880	126.0444	130.5758	(44)
Energy conte	207.3380	182.4414	191.6838	163.6433	155.2639	136.2615	131.9218	139.2597	143.0931	163.9081	179.5734	204.4502	(45)

Energy content (annual) Total = Sum(45)m = 1998.8382

Distribution loss (46)m = 0.15 x (45)m	31.1007	27.3662	28.7526	24.5465	23.2896	20.4392	19.7883	20.8890	21.4640	24.5862	26.9360	30.6675	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9720	(55)
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	260.7324	230.6686	245.0782	215.3153	208.6583	187.9335	185.3162	192.6541	194.7651	217.3025	231.2454	257.8446	(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	260.7324	230.6686	245.0782	215.3153	208.6583	187.9335	185.3162	192.6541	194.7651	217.3025	231.2454	257.8446	(64)

Total per year (kWh/year) = Sum(64)m = 2627.5142 (64)

12Total per year (kWh/year) 2628 (64)
Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	111.6554	99.2435	106.4504	95.7490	94.3408	86.6445	86.5795	89.0194	88.9161	97.2150	101.0458	110.6952	(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	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.3339	124.3697	112.3339	116.0784	112.3339	116.0784	112.3339	112.3339	116.0784	112.3339	116.0784	112.3339	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	210.8782	213.0665	207.5522	195.8128	180.9940	167.0663	157.7618	155.5736	161.0879	172.8273	187.6461	201.5737	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	(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)	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	(71)

Water heating gains (Table 5)													
	150.0745	147.6838	143.0785	132.9847	126.8021	120.3396	116.3703	119.6497	123.4945	130.6653	140.3413	148.7839	(72)
Total internal gains													
	532.0254	543.8588	521.7034	503.6147	478.8688	462.2232	445.2049	446.2960	459.3996	474.5653	502.8046	521.4304	(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	4.8000	10.6334	0.7600	0.7000	0.7700	18.8173	(74)
East	0.8000	19.6403	0.7600	0.7000	0.7700	5.7927	(76)
South	5.8500	46.7521	0.7600	0.7000	0.7700	100.8327	(78)

Solar gains	125.4428	212.4307	290.1247	363.1182	413.3247	414.1156	397.6141	359.0005	314.9163	234.3697	149.9576	107.5795	(83)
Total gains	657.4682	756.2895	811.8281	866.7329	892.1934	876.3388	842.8190	805.2965	774.3160	708.9350	652.7622	629.0098	(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	71.6328	71.7206	71.8070	72.2152	72.2921	72.6523	72.6523	72.7194	72.5132	72.2921	72.1367	71.9750	
alpha	5.7755	5.7814	5.7871	5.8143	5.8195	5.8435	5.8435	5.8480	5.8342	5.8195	5.8091	5.7983	
util living area													
	0.9866	0.9701	0.9385	0.8564	0.7102	0.5181	0.3737	0.4081	0.6225	0.8762	0.9697	0.9893	(86)
Living	20.1635	20.3555	20.5708	20.8063	20.9455	20.9925	20.9991	20.9984	20.9794	20.8097	20.4510	20.1216	
Non living	19.1623	19.4026	19.6664	19.9417	20.0840	20.1263	20.1300	20.1305	20.1163	19.9524	19.5283	19.1126	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5721	20.3555	20.5708	20.8063	20.9455	20.9925	20.9991	20.9984	20.9794	20.8097	20.4510	20.2445	(87)
Th 2	20.1190	20.1200	20.1210	20.1255	20.1264	20.1303	20.1303	20.1311	20.1288	20.1264	20.1247	20.1229	(88)
util rest of house													
	0.9827	0.9620	0.9225	0.8230	0.6559	0.4503	0.3003	0.3317	0.5511	0.8395	0.9601	0.9862	(89)
MIT 2	19.7376	19.4026	19.6664	19.9417	20.0840	20.1263	20.1300	20.1305	20.1163	19.9524	19.5283	19.2946	(90)
Living area fraction										fLA = Living area / (4) =		0.2105	(91)
MIT	19.9133	19.6032	19.8568	20.1237	20.2654	20.3087	20.3130	20.3133	20.2980	20.1329	19.7225	19.4946	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9133	19.6032	19.8568	20.1237	20.2654	20.3087	20.3130	20.3133	20.2980	20.1329	19.7225	19.4946	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9816	0.9562	0.9168	0.8229	0.6649	0.4644	0.3158	0.3478	0.5654	0.8398	0.9546	0.9834	(94)
Useful gains	645.4026	723.1341	744.3082	713.2208	593.1974	406.9452	266.1391	280.0803	437.7821	595.3555	623.1265	618.5628	(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													
	1135.9805	1068.4552	969.4492	810.0202	617.5084	409.5183	266.3565	280.4635	445.4766	687.2604	911.9635	1107.5020	(97)
Space heating kWh													
	364.9900	232.0558	167.5049	69.6956	18.0874	0.0000	0.0000	0.0000	0.0000	68.3772	207.9627	363.7708	(98a)
Space heating requirement - total per year (kWh/year)												1492.4444	
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													
	364.9900	232.0558	167.5049	69.6956	18.0874	0.0000	0.0000	0.0000	0.0000	68.3772	207.9627	363.7708	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1492.4444	
Space heating per m2											(98c) / (4) =	19.6374	(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 %)												252.3686	(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													
	364.9900	232.0558	167.5049	69.6956	18.0874	0.0000	0.0000	0.0000	0.0000	68.3772	207.9627	363.7708	(98)
Space heating efficiency (main heating system 1)													
	252.3686	252.3686	252.3686	252.3686	252.3686	0.0000	0.0000	0.0000	0.0000	252.3686	252.3686	252.3686	(210)
Space heating fuel (main heating system)													
	144.6258	91.9511	66.3731	27.6166	7.1671	0.0000	0.0000	0.0000	0.0000	27.0942	82.4044	144.1427	(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												
	260.7324	230.6686	245.0782	215.3153	208.6583	187.9335	185.3162	192.6541	194.7651	217.3025	231.2454	257.8446 (64)
Efficiency of water heater												171.8800 (216)
(217)m	171.8800	171.8800	171.8800	171.8800	171.8800	171.8800	171.8800	171.8800	171.8800	171.8800	171.8800	171.8800 (217)
Fuel for water heating, kWh/month												
	151.6945	134.2033	142.5869	125.2708	121.3977	109.3399	107.8172	112.0864	113.3146	126.4269	134.5389	150.0143 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	29.4433	23.6205	21.2676	15.5816	12.0357	9.8332	10.9793	14.2714	18.5371	24.3217	27.4713	30.2616 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	591.3749 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	171.8800
Water heating fuel used	1528.6913 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	237.6243 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	2357.6905 (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	591.3749	0.1572	92.9596	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1528.6913	0.1409	215.3811	(264)
Space and water heating			308.3407	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	237.6243	0.1443	34.2965	(268)
Total CO2, kg/year			342.6372	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5100	(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	591.3749	1.5819	935.4930	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1528.6913	1.5210	2325.0919	(278)
Space and water heating			3260.5849	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	237.6243	1.5338	364.4760	(282)
Total Primary energy kWh/year			3625.0609	(286)
Dwelling Primary energy Rate (DPER)			47.7000	(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	38.0000 (1b)	x	2.4000 (2b)	=	91.2000 (1b)	-
First floor	38.0000 (1c)	x	2.4000 (2c)	=	91.2000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.4000	(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) =	0.1645	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4145	(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) =	0.3523	(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	0.4492	0.4404	0.4316	0.3875	0.3787	0.3347	0.3347	0.3259	0.3523	0.3787	0.3963	0.4140	(22b)
Effective ac	0.6009	0.5970	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5621	0.5717	0.5785	0.5857	(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 Opening Type (Uw = 1.20)			11.4500	1.1450	13.1107			(27)
Heatloss Floor 1			38.0000	0.1300	4.9400			(28a)
External Wall 1	86.4000	11.4500	74.9500	0.1800	13.4910			(29a)
External Roof 1	38.0000		38.0000	0.1100	4.1800			(30)
Total net area of external elements Aum(A, m2)			162.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.7217			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							246.8750	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	18.0000	0.1600	2.8800
E6 Intermediate floor within a dwelling	18.0000	0.0000	0.0000
E16 Corner (normal)	9.6000	0.0900	0.8640
E18 Party wall between dwellings	9.6000	0.0600	0.5760
E2 Other lintels (including other steel lintels)	5.2000	0.0500	0.2600
E3 Sill	3.4500	0.0500	0.1725
E4 Jamb	8.9000	0.0500	0.4450
E11 Eaves (insulation at rafter level)	8.2000	0.0400	0.3280
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.1255	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	41.8472	(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	36.1684	35.9326	35.7015	34.6159	34.4128	33.4672	33.4672	33.2921	33.8314	34.4128	34.8237	35.2532	(38)
Heat transfer coeff	78.0156	77.7798	77.5487	76.4631	76.2599	75.3144	75.3144	75.1393	75.6786	76.2599	76.6708	77.1004	(39)
Average = Sum(39)m / 12 =												76.4621	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0265	1.0234	1.0204	1.0061	1.0034	0.9910	0.9910	0.9887	0.9958	1.0034	1.0088	1.0145	(40)
HLP (average)												1.0061	
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 2.3826 (42)

Hot water usage for mixer showers

64.1678	63.2035	61.7983	59.1097	57.1256	54.9129	53.6553	55.0498	56.5785	58.9543	61.7006	63.9220 (42a)

Hot water usage for baths

27.7175	27.3058	26.7262	25.6573	24.8570	23.9696	23.4902	24.0659	24.6926	25.6422	26.7330	27.6238 (42b)

Hot water usage for other uses

39.0301	37.6108	36.1915	34.7722	33.3530	31.9337	31.9337	33.3530	34.7722	36.1915	37.6108	39.0301 (42c)

Average daily hot water use (litres/day) 120.3410 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	130.9154	128.1202	124.7160	119.5393	115.3356	110.8162	109.0792	112.4686	116.0434	120.7880	126.0444	130.5758	(44)
Energy conte	207.3380	182.4414	191.6838	163.6433	155.2639	136.2615	131.9218	139.2597	143.0931	163.9081	179.5734	204.4502	(45)
Energy content (annual)										Total = Sum(45)m =		1998.8382	
Distribution loss (46)m = 0.15 x (45)m													
	31.1007	27.3662	28.7526	24.5465	23.2896	20.4392	19.7883	20.8890	21.4640	24.5862	26.9360	30.6675	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	253.9329	224.5271	238.2788	208.7352	201.8588	181.3533	178.5167	185.8546	188.1849	210.5030	224.6652	251.0451	(62)
WWHRS	-29.3349	-25.9440	-27.1670	-22.4954	-20.9649	-17.9398	-16.8157	-17.8818	-18.5612	-21.8816	-24.7892	-28.7916	(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													
	224.5980	198.5831	211.1117	186.2398	180.8939	163.4135	161.7010	167.9728	169.6237	188.6214	199.8760	222.2535	(64)
										Total per year (kWh/year) = Sum(64)m =		2274.8884	(64)
12Total per year (kWh/year)												2275	(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													
	106.2158	94.3303	101.0108	90.4849	88.9012	81.3804	81.1399	83.5798	83.6519	91.7754	95.7816	105.2556	(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	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	112.3339	124.3697	112.3339	116.0784	112.3339	116.0784	112.3339	112.3339	116.0784	112.3339	116.0784	112.3339	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	210.8782	213.0665	207.5522	195.8128	180.9940	167.0663	157.7618	155.5736	161.0879	172.8273	187.6461	201.5737	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	(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)													
	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	(71)
Water heating gains (Table 5)													
	142.7632	140.3725	135.7672	125.6734	119.4908	113.0283	109.0590	112.3384	116.1832	123.3540	133.0300	141.4726	(72)
Total internal gains													
	527.7142	539.5475	517.3921	499.3034	474.5575	454.9119	437.8936	438.9847	452.0883	470.2540	498.4934	517.1191	(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	4.8000	10.6334	0.6300	0.7000	0.7700	15.5986	(74)
East	0.8000	19.6403	0.6300	0.7000	0.7700	4.8019	(76)
South	5.8500	46.7521	0.6300	0.7000	0.7700	83.5850	(78)

Solar gains	103.9855	176.0939	240.4981	301.0058	342.6244	343.2801	329.6011	297.5925	261.0491	194.2801	124.3070	89.1777	(83)
Total gains	631.6996	715.6414	757.8902	800.3093	817.1819	798.1919	767.4947	736.5772	713.1374	664.5342	622.8003	606.2968	(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	66.8047	67.0072	67.2069	68.1611	68.3426	69.2006	69.2006	69.3619	68.8676	68.3426	67.9764	67.5976	
alpha	5.4536	5.4671	5.4805	5.5441	5.5562	5.6134	5.6134	5.6241	5.5912	5.5562	5.5318	5.5065	
util living area	0.9900	0.9793	0.9593	0.9014	0.7816	0.5893	0.4296	0.4657	0.6929	0.9116	0.9781	0.9918	(86)
MIT	20.0124	20.1958	20.4201	20.7018	20.8968	20.9829	20.9975	20.9962	20.9588	20.7258	20.3322	19.9861	(87)
Th 2	20.0613	20.0639	20.0664	20.0783	20.0805	20.0909	20.0909	20.0928	20.0869	20.0805	20.0760	20.0713	(88)
util rest of house	0.9870	0.9733	0.9474	0.8736	0.7277	0.5118	0.3420	0.3757	0.6160	0.8808	0.9706	0.9893	(89)
MIT 2	18.9275	19.1601	19.4408	19.7862	19.9971	20.0814	20.0901	20.0914	20.0609	19.8219	19.3433	18.9017	(90)
Living area fraction										fLA = Living area / (4) =		0.2105	(91)
MIT	19.1559	19.3782	19.6470	19.9789	20.1865	20.2712	20.2811	20.2819	20.2500	20.0122	19.5515	19.1300	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1559	19.3782	19.6470	19.9789	20.1865	20.2712	20.2811	20.2819	20.2500	20.0122	19.5515	19.1300	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9830	0.9677	0.9408	0.8702	0.7344	0.5276	0.3605	0.3947	0.6304	0.8781	0.9651	0.9859	(94)
Useful gains	620.9894	692.5322	713.0391	696.4321	600.1426	421.0872	276.6562	290.7190	449.5973	583.5528	601.0817	597.7583	(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	1158.9910	1126.1076	1019.5316	847.1289	647.1791	427.1205	277.2402	291.6835	465.4216	717.7715	954.6678	1151.1116	(97)
Space heating kWh	400.2733	291.3627	228.0304	108.5016	34.9952	0.0000	0.0000	0.0000	0.0000	99.8587	254.5820	411.6948	(98a)
Space heating requirement - total per year (kWh/year)												1829.2987	
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	400.2733	291.3627	228.0304	108.5016	34.9952	0.0000	0.0000	0.0000	0.0000	99.8587	254.5820	411.6948	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1829.2987	
Space heating per m2										(98c) / (4) =		24.0697	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	400.2733	291.3627	228.0304	108.5016	34.9952	0.0000	0.0000	0.0000	0.0000	99.8587	254.5820	411.6948	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	433.6655	315.6692	247.0535	117.5532	37.9146	0.0000	0.0000	0.0000	0.0000	108.1893	275.8201	446.0399	(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	224.5980	198.5831	211.1117	186.2398	180.8939	163.4135	161.7010	167.9728	169.6237	188.6214	199.8760	222.2535	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3405	84.9182	84.2330	82.8927	81.1329	79.8000	79.8000	79.8000	79.8000	82.7014	84.6034	85.4224	(217)
Fuel for water heating, kWh/month	263.1786	233.8523	250.6282	224.6757	222.9599	204.7788	202.6328	210.4922	212.5610	228.0751	236.2505	260.1817	(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	23.3408	18.7248	16.8596	12.3521	9.5411	7.7952	8.7037	11.3134	14.6950	19.2807	21.7775	23.9895	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-35.5474	-50.1084	-72.0167	-80.9645	-87.3016	-81.4898	-80.4894	-75.9946	-68.0501	-57.3031	-39.0809	-30.7341	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-20.0921	-42.2714	-84.0261	-126.2126	-166.8935	-167.6889	-165.7084	-140.2930	-102.8201	-60.4466	-26.8247	-15.8873	(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												1981.9054	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	79.8000
Water heating fuel used	2750.2669 (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)	188.3734 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1878.2452 (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	3128.3005 (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	1981.9054	0.2100	416.2001	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2750.2669	0.2100	577.5560	(264)
Space and water heating			993.7562	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	188.3734	0.1443	27.1881	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-759.0806	0.1346	-102.1626	
PV Unit electricity exported	-1119.1646	0.1259	-140.8964	
Total			-243.0590	(269)
Total CO2, kg/year			789.8146	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3900	(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	1981.9054	1.1300	2239.5531	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2750.2669	1.1300	3107.8016	(278)
Space and water heating			5347.3547	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	188.3734	1.5338	288.9334	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-759.0806	1.4974	-1136.6561	
PV Unit electricity exported	-1119.1646	0.4621	-517.1868	
Total			-1653.8429	(283)
Total Primary energy kWh/year			4112.5460	(286)
Target Primary Energy Rate (TPER)			54.1100	(287)

Full SAP Calculation Printout

Property Reference	House Type D	Issued on Date	05/10/2023
Assessment Reference	Plot 42	Prop Type Ref	
Property			

SAP Rating	82 B	DER	4.51	TER	10.39
Environmental	96 A	% DER < TER			56.59
CO_2 Emissions (t/year)	0.32	DFEE	27.55	TFEE	30.77
Compliance Check	See BREL	% DFEE < TFEE			10.45
% DPER < TPER	11.85	DPER	47.70	TPER	54.11

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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			38.0000 (1b)	x	2.4000 (2b)	=	91.2000 (1b)	-
First floor			38.0000 (1c)	x	2.4000 (2c)	=	91.2000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.0000							(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.4000	(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		1 * 10	=	10.0000 (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) =		10.0000 / (5)	=	0.0548 (8)
Pressure test		Yes		
Pressure Test Method		Blower Door		
Measured/design AP50		4.0000		(17)
Infiltration rate		0.2548		(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)	=	0.2166 (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	0.2762	0.2708	0.2653	0.2383	0.2328	0.2058	0.2058	0.2004	0.2166	0.2328	0.2437	0.2545	(22b)
Effective ac	0.5381	0.5367	0.5352	0.5284	0.5271	0.5212	0.5212	0.5201	0.5235	0.5271	0.5297	0.5324	(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	
Opening Type 1 (Uw = 1.20)			11.4500	1.1450	13.1107			(27)
Heatloss Floor 1			38.0000	0.1200	4.5600	110.0000	4180.0000	(28a)
External Wall 1	86.4000	11.4500	74.9500	0.1900	14.2405	190.0000	14240.5000	(29a)
External Roof 1	38.0000		38.0000	0.1500	5.7000	9.0000	342.0000	(30)
Total net area of external elements Aum(A, m2)			162.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.6112			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18762.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 246.8750 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	18.0000	0.0670	1.2060
E6 Intermediate floor within a dwelling	18.0000	0.0020	0.0360
E16 Corner (normal)	9.6000	0.0410	0.3936
E18 Party wall between dwellings	9.6000	0.0400	0.3840
E2 Other lintels (including other steel lintels)	5.2000	0.0240	0.1248
E3 Sill	3.4500	0.0190	0.0655
E4 Jamb	8.9000	0.0140	0.1246
E11 Eaves (insulation at rafter level)	8.2000	0.0110	0.0902
E12 Gable (insulation at ceiling level)	10.0000	0.0330	0.3300

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.7548 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.3659 (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	32.3914	32.3022	32.2149	31.8045	31.7277	31.3703	31.3703	31.3041	31.5080	31.7277	31.8830	32.0454	(38)
Heat transfer coeff	72.7573	72.6682	72.5808	72.1704	72.0937	71.7363	71.7363	71.6701	71.8739	72.0937	72.2490	72.4114	(39)

Average = Sum(39)m / 12 = 72.1701

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9573	0.9562	0.9550	0.9496	0.9486	0.9439	0.9439	0.9430	0.9457	0.9486	0.9506	0.9528	(40)
HLP (average)												0.9496	
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 2.3826 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	64.1678	63.2035	61.7983	59.1097	57.1256	54.9129	53.6553	55.0498	56.5785	58.9543	61.7006	63.9220	(42a)
Hot water usage for baths	27.7175	27.3058	26.7262	25.6573	24.8570	23.9696	23.4902	24.0659	24.6926	25.6422	26.7330	27.6238	(42b)
Hot water usage for other uses	39.0301	37.6108	36.1915	34.7722	33.3530	31.9337	31.9337	33.3530	34.7722	36.1915	37.6108	39.0301	(42c)

Average daily hot water use (litres/day) 120.3410 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.9154	128.1202	124.7160	119.5393	115.3356	110.8162	109.0792	112.4686	116.0434	120.7880	126.0444	130.5758	(44)
Energy conte	207.3380	182.4414	191.6838	163.6433	155.2639	136.2615	131.9218	139.2597	143.0931	163.9081	179.5734	204.4502	(45)

Energy content (annual) Total = Sum(45)m = 1998.8382

Distribution loss (46)m = 0.15 x (45)m	31.1007	27.3662	28.7526	24.5465	23.2896	20.4392	19.7883	20.8890	21.4640	24.5862	26.9360	30.6675	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9720	(55)
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	260.7324	230.6686	245.0782	215.3153	208.6583	187.9335	185.3162	192.6541	194.7651	217.3025	231.2454	257.8446	(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	260.7324	230.6686	245.0782	215.3153	208.6583	187.9335	185.3162	192.6541	194.7651	217.3025	231.2454	257.8446	(64)

Total per year (kWh/year) = Sum(64)m = 2627.5142 (64)

12Total per year (kWh/year) 2628 (64)
Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month	111.6554	99.2435	106.4504	95.7490	94.3408	86.6445	86.5795	89.0194	88.9161	97.2150	101.0458	110.6952	(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	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.3339	124.3697	112.3339	116.0784	112.3339	116.0784	112.3339	112.3339	116.0784	112.3339	116.0784	112.3339	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	210.8782	213.0665	207.5522	195.8128	180.9940	167.0663	157.7618	155.5736	161.0879	172.8273	187.6461	201.5737	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	(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)	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	(71)

Water heating gains (Table 5)													
	150.0745	147.6838	143.0785	132.9847	126.8021	120.3396	116.3703	119.6497	123.4945	130.6653	140.3413	148.7839	(72)
Total internal gains													
	532.0254	543.8588	521.7034	503.6147	478.8688	462.2232	445.2049	446.2960	459.3996	474.5653	502.8046	521.4304	(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	4.8000	10.6334	0.7600	0.7000	0.7700	18.8173	(74)
East	0.8000	19.6403	0.7600	0.7000	0.7700	5.7927	(76)
South	5.8500	46.7521	0.7600	0.7000	0.7700	100.8327	(78)

Solar gains	125.4428	212.4307	290.1247	363.1182	413.3247	414.1156	397.6141	359.0005	314.9163	234.3697	149.9576	107.5795	(83)
Total gains	657.4682	756.2895	811.8281	866.7329	892.1934	876.3388	842.8190	805.2965	774.3160	708.9350	652.7622	629.0098	(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	71.6328	71.7206	71.8070	72.2152	72.2921	72.6523	72.6523	72.7194	72.5132	72.2921	72.1367	71.9750	
alpha	5.7755	5.7814	5.7871	5.8143	5.8195	5.8435	5.8435	5.8480	5.8342	5.8195	5.8091	5.7983	
util living area													
	0.9866	0.9701	0.9385	0.8564	0.7102	0.5181	0.3737	0.4081	0.6225	0.8762	0.9697	0.9893	(86)
Living	20.1635	20.3555	20.5708	20.8063	20.9455	20.9925	20.9991	20.9984	20.9794	20.8097	20.4510	20.1216	
Non living	19.1623	19.4026	19.6664	19.9417	20.0840	20.1263	20.1300	20.1305	20.1163	19.9524	19.5283	19.1126	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5721	20.3555	20.5708	20.8063	20.9455	20.9925	20.9991	20.9984	20.9794	20.8097	20.4510	20.2445	(87)
Th 2	20.1190	20.1200	20.1210	20.1255	20.1264	20.1303	20.1303	20.1311	20.1288	20.1264	20.1247	20.1229	(88)
util rest of house													
	0.9827	0.9620	0.9225	0.8230	0.6559	0.4503	0.3003	0.3317	0.5511	0.8395	0.9601	0.9862	(89)
MIT 2	19.7376	19.4026	19.6664	19.9417	20.0840	20.1263	20.1300	20.1305	20.1163	19.9524	19.5283	19.2946	(90)
Living area fraction										fLA = Living area / (4) =		0.2105	(91)
MIT	19.9133	19.6032	19.8568	20.1237	20.2654	20.3087	20.3130	20.3133	20.2980	20.1329	19.7225	19.4946	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9133	19.6032	19.8568	20.1237	20.2654	20.3087	20.3130	20.3133	20.2980	20.1329	19.7225	19.4946	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9816	0.9562	0.9168	0.8229	0.6649	0.4644	0.3158	0.3478	0.5654	0.8398	0.9546	0.9834	(94)
Useful gains	645.4026	723.1341	744.3082	713.2208	593.1974	406.9452	266.1391	280.0803	437.7821	595.3555	623.1265	618.5628	(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													
	1135.9805	1068.4552	969.4492	810.0202	617.5084	409.5183	266.3565	280.4635	445.4766	687.2604	911.9635	1107.5020	(97)
Space heating kWh													
	364.9900	232.0558	167.5049	69.6956	18.0874	0.0000	0.0000	0.0000	0.0000	68.3772	207.9627	363.7708	(98a)
Space heating requirement - total per year (kWh/year)												1492.4444	
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													
	364.9900	232.0558	167.5049	69.6956	18.0874	0.0000	0.0000	0.0000	0.0000	68.3772	207.9627	363.7708	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1492.4444	
Space heating per m2											(98c) / (4) =	19.6374	(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 %)												252.3686	(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													
	364.9900	232.0558	167.5049	69.6956	18.0874	0.0000	0.0000	0.0000	0.0000	68.3772	207.9627	363.7708	(98)
Space heating efficiency (main heating system 1)													
	252.3686	252.3686	252.3686	252.3686	252.3686	0.0000	0.0000	0.0000	0.0000	252.3686	252.3686	252.3686	(210)
Space heating fuel (main heating system)													
	144.6258	91.9511	66.3731	27.6166	7.1671	0.0000	0.0000	0.0000	0.0000	27.0942	82.4044	144.1427	(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												
	260.7324	230.6686	245.0782	215.3153	208.6583	187.9335	185.3162	192.6541	194.7651	217.3025	231.2454	257.8446 (64)
Efficiency of water heater												171.8800 (216)
(217)m	171.8800	171.8800	171.8800	171.8800	171.8800	171.8800	171.8800	171.8800	171.8800	171.8800	171.8800	171.8800 (217)
Fuel for water heating, kWh/month												
	151.6945	134.2033	142.5869	125.2708	121.3977	109.3399	107.8172	112.0864	113.3146	126.4269	134.5389	150.0143 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	29.4433	23.6205	21.2676	15.5816	12.0357	9.8332	10.9793	14.2714	18.5371	24.3217	27.4713	30.2616 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	591.3749 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	171.8800
Water heating fuel used	1528.6913 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	237.6243 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	2357.6905 (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	591.3749	0.1572	92.9596	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1528.6913	0.1409	215.3811	(264)
Space and water heating			308.3407	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	237.6243	0.1443	34.2965	(268)
Total CO2, kg/year			342.6372	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5100	(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	591.3749	1.5819	935.4930	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1528.6913	1.5210	2325.0919	(278)
Space and water heating			3260.5849	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	237.6243	1.5338	364.4760	(282)
Total Primary energy kWh/year			3625.0609	(286)
Dwelling Primary energy Rate (DPER)			47.7000	(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	38.0000 (1b)	x	2.4000 (2b)	=	91.2000 (1b)	-
First floor	38.0000 (1c)	x	2.4000 (2c)	=	91.2000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.4000	(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) =	0.1645	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4145	(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) =	0.3523	(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	0.4492	0.4404	0.4316	0.3875	0.3787	0.3347	0.3347	0.3259	0.3523	0.3787	0.3963	0.4140	(22b)
Effective ac	0.6009	0.5970	0.5931	0.5751	0.5717	0.5560	0.5560	0.5531	0.5621	0.5717	0.5785	0.5857	(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 Opening Type (Uw = 1.20)			11.4500	1.1450	13.1107			(27)
Heatloss Floor 1			38.0000	0.1300	4.9400			(28a)
External Wall 1	86.4000	11.4500	74.9500	0.1800	13.4910			(29a)
External Roof 1	38.0000		38.0000	0.1100	4.1800			(30)
Total net area of external elements Aum(A, m2)			162.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.7217			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							246.8750	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	18.0000	0.1600	2.8800
E6 Intermediate floor within a dwelling	18.0000	0.0000	0.0000
E16 Corner (normal)	9.6000	0.0900	0.8640
E18 Party wall between dwellings	9.6000	0.0600	0.5760
E2 Other lintels (including other steel lintels)	5.2000	0.0500	0.2600
E3 Sill	3.4500	0.0500	0.1725
E4 Jamb	8.9000	0.0500	0.4450
E11 Eaves (insulation at rafter level)	8.2000	0.0400	0.3280
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.1255	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	41.8472	(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	36.1684	35.9326	35.7015	34.6159	34.4128	33.4672	33.4672	33.2921	33.8314	34.4128	34.8237	35.2532	(38)
Heat transfer coeff	78.0156	77.7798	77.5487	76.4631	76.2599	75.3144	75.3144	75.1393	75.6786	76.2599	76.6708	77.1004	(39)
Average = Sum(39)m / 12 =												76.4621	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0265	1.0234	1.0204	1.0061	1.0034	0.9910	0.9910	0.9887	0.9958	1.0034	1.0088	1.0145	(40)
HLP (average)												1.0061	
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 2.3826 (42)

Hot water usage for mixer showers

64.1678	63.2035	61.7983	59.1097	57.1256	54.9129	53.6553	55.0498	56.5785	58.9543	61.7006	63.9220 (42a)

Hot water usage for baths

27.7175	27.3058	26.7262	25.6573	24.8570	23.9696	23.4902	24.0659	24.6926	25.6422	26.7330	27.6238 (42b)

Hot water usage for other uses

39.0301	37.6108	36.1915	34.7722	33.3530	31.9337	31.9337	33.3530	34.7722	36.1915	37.6108	39.0301 (42c)

Average daily hot water use (litres/day) 120.3410 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	130.9154	128.1202	124.7160	119.5393	115.3356	110.8162	109.0792	112.4686	116.0434	120.7880	126.0444	130.5758	(44)
Energy conte	207.3380	182.4414	191.6838	163.6433	155.2639	136.2615	131.9218	139.2597	143.0931	163.9081	179.5734	204.4502	(45)
Energy content (annual)										Total = Sum(45)m =		1998.8382	
Distribution loss (46)m = 0.15 x (45)m													
	31.1007	27.3662	28.7526	24.5465	23.2896	20.4392	19.7883	20.8890	21.4640	24.5862	26.9360	30.6675	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	253.9329	224.5271	238.2788	208.7352	201.8588	181.3533	178.5167	185.8546	188.1849	210.5030	224.6652	251.0451	(62)
WWHRS	-29.3349	-25.9440	-27.1670	-22.4954	-20.9649	-17.9398	-16.8157	-17.8818	-18.5612	-21.8816	-24.7892	-28.7916	(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													
	224.5980	198.5831	211.1117	186.2398	180.8939	163.4135	161.7010	167.9728	169.6237	188.6214	199.8760	222.2535	(64)
										Total per year (kWh/year) = Sum(64)m =		2274.8884	(64)
12Total per year (kWh/year)												2275	(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													
	106.2158	94.3303	101.0108	90.4849	88.9012	81.3804	81.1399	83.5798	83.6519	91.7754	95.7816	105.2556	(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	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	112.3339	124.3697	112.3339	116.0784	112.3339	116.0784	112.3339	112.3339	116.0784	112.3339	116.0784	112.3339	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	210.8782	213.0665	207.5522	195.8128	180.9940	167.0663	157.7618	155.5736	161.0879	172.8273	187.6461	201.5737	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	(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)													
	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	(71)
Water heating gains (Table 5)													
	142.7632	140.3725	135.7672	125.6734	119.4908	113.0283	109.0590	112.3384	116.1832	123.3540	133.0300	141.4726	(72)
Total internal gains													
	527.7142	539.5475	517.3921	499.3034	474.5575	454.9119	437.8936	438.9847	452.0883	470.2540	498.4934	517.1191	(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	4.8000	10.6334	0.6300	0.7000	0.7700	15.5986	(74)
East	0.8000	19.6403	0.6300	0.7000	0.7700	4.8019	(76)
South	5.8500	46.7521	0.6300	0.7000	0.7700	83.5850	(78)

Solar gains	103.9855	176.0939	240.4981	301.0058	342.6244	343.2801	329.6011	297.5925	261.0491	194.2801	124.3070	89.1777	(83)
Total gains	631.6996	715.6414	757.8902	800.3093	817.1819	798.1919	767.4947	736.5772	713.1374	664.5342	622.8003	606.2968	(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	66.8047	67.0072	67.2069	68.1611	68.3426	69.2006	69.2006	69.3619	68.8676	68.3426	67.9764	67.5976	
alpha	5.4536	5.4671	5.4805	5.5441	5.5562	5.6134	5.6134	5.6241	5.5912	5.5562	5.5318	5.5065	
util living area	0.9900	0.9793	0.9593	0.9014	0.7816	0.5893	0.4296	0.4657	0.6929	0.9116	0.9781	0.9918	(86)
MIT	20.0124	20.1958	20.4201	20.7018	20.8968	20.9829	20.9975	20.9962	20.9588	20.7258	20.3322	19.9861	(87)
Th 2	20.0613	20.0639	20.0664	20.0783	20.0805	20.0909	20.0909	20.0928	20.0869	20.0805	20.0760	20.0713	(88)
util rest of house	0.9870	0.9733	0.9474	0.8736	0.7277	0.5118	0.3420	0.3757	0.6160	0.8808	0.9706	0.9893	(89)
MIT 2	18.9275	19.1601	19.4408	19.7862	19.9971	20.0814	20.0901	20.0914	20.0609	19.8219	19.3433	18.9017	(90)
Living area fraction										fLA = Living area / (4) =		0.2105	(91)
MIT	19.1559	19.3782	19.6470	19.9789	20.1865	20.2712	20.2811	20.2819	20.2500	20.0122	19.5515	19.1300	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1559	19.3782	19.6470	19.9789	20.1865	20.2712	20.2811	20.2819	20.2500	20.0122	19.5515	19.1300	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9830	0.9677	0.9408	0.8702	0.7344	0.5276	0.3605	0.3947	0.6304	0.8781	0.9651	0.9859	(94)
Useful gains	620.9894	692.5322	713.0391	696.4321	600.1426	421.0872	276.6562	290.7190	449.5973	583.5528	601.0817	597.7583	(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	1158.9910	1126.1076	1019.5316	847.1289	647.1791	427.1205	277.2402	291.6835	465.4216	717.7715	954.6678	1151.1116	(97)
Space heating kWh	400.2733	291.3627	228.0304	108.5016	34.9952	0.0000	0.0000	0.0000	0.0000	99.8587	254.5820	411.6948	(98a)
Space heating requirement - total per year (kWh/year)												1829.2987	
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	400.2733	291.3627	228.0304	108.5016	34.9952	0.0000	0.0000	0.0000	0.0000	99.8587	254.5820	411.6948	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1829.2987	
Space heating per m2										(98c) / (4) =		24.0697	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	400.2733	291.3627	228.0304	108.5016	34.9952	0.0000	0.0000	0.0000	0.0000	99.8587	254.5820	411.6948	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	433.6655	315.6692	247.0535	117.5532	37.9146	0.0000	0.0000	0.0000	0.0000	108.1893	275.8201	446.0399	(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	224.5980	198.5831	211.1117	186.2398	180.8939	163.4135	161.7010	167.9728	169.6237	188.6214	199.8760	222.2535	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3405	84.9182	84.2330	82.8927	81.1329	79.8000	79.8000	79.8000	79.8000	82.7014	84.6034	85.4224	(217)
Fuel for water heating, kWh/month	263.1786	233.8523	250.6282	224.6757	222.9599	204.7788	202.6328	210.4922	212.5610	228.0751	236.2505	260.1817	(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	23.3408	18.7248	16.8596	12.3521	9.5411	7.7952	8.7037	11.3134	14.6950	19.2807	21.7775	23.9895	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-35.5474	-50.1084	-72.0167	-80.9645	-87.3016	-81.4898	-80.4894	-75.9946	-68.0501	-57.3031	-39.0809	-30.7341	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-20.0921	-42.2714	-84.0261	-126.2126	-166.8935	-167.6889	-165.7084	-140.2930	-102.8201	-60.4466	-26.8247	-15.8873	(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												1981.9054	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	79.8000
Water heating fuel used	2750.2669 (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)	188.3734 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1878.2452 (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	3128.3005 (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	1981.9054	0.2100	416.2001	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2750.2669	0.2100	577.5560	(264)
Space and water heating			993.7562	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	188.3734	0.1443	27.1881	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-759.0806	0.1346	-102.1626	
PV Unit electricity exported	-1119.1646	0.1259	-140.8964	
Total			-243.0590	(269)
Total CO2, kg/year			789.8146	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3900	(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	1981.9054	1.1300	2239.5531	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2750.2669	1.1300	3107.8016	(278)
Space and water heating			5347.3547	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	188.3734	1.5338	288.9334	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-759.0806	1.4974	-1136.6561	
PV Unit electricity exported	-1119.1646	0.4621	-517.1868	
Total			-1653.8429	(283)
Total Primary energy kWh/year			4112.5460	(286)
Target Primary Energy Rate (TPER)			54.1100	(287)

Full SAP Calculation Printout

Property Reference	House Type J	Issued on Date	05/10/2023
Assessment Reference	Plot 43	Prop Type Ref	
Property			

SAP Rating	82 B	DER	3.90	TER	9.39
Environmental	96 A	% DER < TER			58.47
CO_2 Emissions (t/year)	0.45	DFEE	35.82	TFEE	39.48
Compliance Check	See BREL	% DFEE < TFEE			9.26
% DPER < TPER	16.53	DPER	40.93	TPER	49.03

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	70.0000 (1b)	x	2.4000 (2b)	=	168.0000 (1b)	-
First floor	56.0000 (1c)	x	2.4000 (2c)	=	134.4000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	302.4000	(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	1 * 10	=	10.0000 (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) =	10.0000 / (5)	=	0.0331 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			4.0000 (17)
Infiltration rate			0.2331 (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)	=	0.1981 (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	0.2526	0.2476	0.2427	0.2179	0.2130	0.1882	0.1882	0.1833	0.1981	0.2130	0.2229	0.2328	(22b)
Effective ac	0.5319	0.5307	0.5294	0.5237	0.5227	0.5177	0.5177	0.5168	0.5196	0.5227	0.5248	0.5271	(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	
Opening Type 1 (Uw = 1.20)			35.5000	1.1450	40.6489			(27)
Heatloss Floor 1			70.0000	0.1200	8.4000	110.0000	7700.0000	(28a)
External Wall 1	172.0000	35.5000	136.5000	0.1900	25.9350	190.0000	25935.0000	(29a)
External Roof 1	14.0000		14.0000	0.1500	2.1000	9.0000	126.0000	(30)
External Roof 2	56.0000		56.0000	0.1500	8.4000	9.0000	504.0000	(30)
Total net area of external elements Aum(A, m2)			312.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	85.4839			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 34265.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 271.9444 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	40.0000	0.0670	2.6800
E6 Intermediate floor within a dwelling	32.0000	0.0020	0.0640
E2 Other lintels (including other steel lintels)	19.7000	0.0240	0.4728
E3 Sill	14.3000	0.0190	0.2717
E4 Jamb	43.9000	0.0140	0.6146
E10 Eaves (insulation at ceiling level)	18.0000	0.0460	0.8280
E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3271 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 90.8110 (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	53.0794	52.9558	52.8346	52.2655	52.1590	51.6633	51.6633	51.5715	51.8543	52.1590	52.3744	52.5996	(38)
Heat transfer coeff	143.8904	143.7667	143.6456	143.0765	142.9700	142.4743	142.4743	142.3825	142.6652	142.9700	143.1854	143.4106	(39)

Average = Sum(39)m / 12 = 143.0759

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1420	1.1410	1.1400	1.1355	1.1347	1.1307	1.1307	1.1300	1.1323	1.1347	1.1364	1.1382	(40)
HLP (average)												1.1355	
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 2.8838 (42)
Hot water usage for mixer showers

72.5718	71.4812	69.8920	66.8513	64.6073	62.1048	60.6824	62.2596	63.9886	66.6754	69.7815	72.2938	(42a)

Hot water usage for baths

31.3315	30.8662	30.2109	29.0027	28.0980	27.0949	26.5531	27.2037	27.9122	28.9856	30.2187	31.2256	(42b)

Hot water usage for other uses

44.1631	42.5572	40.9512	39.3453	37.7394	36.1334	36.1334	37.7394	39.3453	40.9512	42.5572	44.1631	(42c)

Average daily hot water use (litres/day) 136.1063 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.0664	144.9046	141.0541	135.1993	130.4447	125.3332	123.3689	127.2028	131.2461	136.6123	142.5573	147.6825	(44)
Energy conte	234.5010	206.3422	216.7950	185.0811	175.6037	154.1118	149.2040	157.5036	161.8395	185.3816	203.0990	231.2350	(45)

Energy content (annual) Total = Sum(45)m = 2260.6975

Distribution loss (46)m = 0.15 x (45)m	35.1752	30.9513	32.5192	27.7622	26.3405	23.1168	22.3806	23.6255	24.2759	27.8072	30.4649	34.6853	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

287.8954	254.5694	270.1894	236.7531	228.9981	205.7838	202.5984	210.8980	213.5115	238.7760	254.7710	284.6294	(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

287.8954	254.5694	270.1894	236.7531	228.9981	205.7838	202.5984	210.8980	213.5115	238.7760	254.7710	284.6294	(64)

Total per year (kWh/year) = Sum(64)m = 2889.3735 (64)
12Total per year (kWh/year) 2889 (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

120.6871	107.1905	114.7998	102.8771	101.1037	92.5798	92.3259	95.0855	95.1492	104.3549	108.8680	119.6012	(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	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	147.7001	163.5251	147.7001	152.6234	147.7001	152.6234	147.7001	147.7001	152.6234	147.7001	152.6234	147.7001	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	292.8319	295.8706	288.2132	271.9116	251.3337	231.9934	219.0729	216.0342	223.6916	239.9932	260.5711	279.9114	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	(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)													
	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	(71)
Water heating gains (Table 5)													

	162.2139	159.5097	154.3009	142.8848	135.8921	128.5830	124.0939	127.8030	132.1517	140.2620	151.2056	160.7543 (72)
Total internal gains	669.0030	685.1626	656.4713	633.6770	601.1831	579.4570	557.1240	557.7945	574.7239	594.2124	630.6573	654.6229 (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	11.9000	10.6334	0.7600	0.7000	0.7700	46.6513 (74)
East	7.1000	19.6403	0.7600	0.7000	0.7700	51.4103 (76)
South	11.8000	46.7521	0.7600	0.7000	0.7700	203.3891 (78)
West	4.7000	19.6403	0.7600	0.7000	0.7700	34.0322 (80)

Solar gains	335.4829	589.3957	851.0636	1124.3506	1319.5245	1335.4853	1277.0078	1128.1345	945.5252	663.7336	405.1726	284.9015 (83)
Total gains	1004.4860	1274.5583	1507.5350	1758.0275	1920.7075	1914.9423	1834.1318	1685.9290	1520.2491	1257.9460	1035.8299	939.5244 (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	66.1480	66.2048	66.2607	66.5243	66.5738	66.8054	66.8054	66.8485	66.7160	66.5738	66.4737	66.3693	
alpha	5.4099	5.4137	5.4174	5.4350	5.4383	5.4537	5.4537	5.4566	5.4477	5.4383	5.4316	5.4246	
util living area	0.9948	0.9818	0.9452	0.8380	0.6605	0.4718	0.3411	0.3871	0.6248	0.9059	0.9860	0.9963	(86)
Living	19.8817	20.1528	20.4756	20.7943	20.9513	20.9933	20.9991	20.9982	20.9724	20.7230	20.2273	19.8256	
Non living	18.6819	19.0244	19.4211	19.7855	19.9378	19.9726	19.9756	19.9759	19.9592	19.7213	19.1245	18.6126	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	6	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	25	10	0	0	0	0	0	0	0	0	0	31	
MIT	20.4892	20.2840	20.4756	20.7943	20.9513	20.9933	20.9991	20.9982	20.9724	20.7230	20.2273	20.3348	(87)
Th 2	19.9667	19.9675	19.9683	19.9719	19.9726	19.9758	19.9758	19.9764	19.9746	19.9726	19.9712	19.9698	(88)
util rest of house	0.9930	0.9759	0.9284	0.7975	0.5981	0.3983	0.2621	0.3017	0.5414	0.8701	0.9804	0.9950	(89)
MIT 2	19.5094	19.2126	19.4211	19.7855	19.9378	19.9726	19.9756	19.9759	19.9592	19.7213	19.1245	19.3708	(90)
Living area fraction										fLA = Living area / (4) =		0.1429	(91)
MIT	19.6493	19.3656	19.5718	19.9296	20.0826	20.1184	20.1218	20.1219	20.1040	19.8644	19.2821	19.5085	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6493	19.3656	19.5718	19.9296	20.0826	20.1184	20.1218	20.1219	20.1040	19.8644	19.2821	19.5085	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9923	0.9714	0.9206	0.7956	0.6050	0.4087	0.2734	0.3139	0.5524	0.8656	0.9752	0.9942	(94)
Useful gains	996.7207	1238.1419	1387.8249	1398.7507	1162.0430	782.6114	501.4514	529.2764	839.7163	1088.8882	1010.1180	934.1211	(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	2208.6214	2079.6776	1877.7014	1578.0804	1198.4547	786.2333	501.7616	529.9341	856.5561	1324.5356	1744.2934	2195.3996	(97)
Space heating kWh	901.6541	565.5119	364.4682	129.1174	27.0903	0.0000	0.0000	0.0000	0.0000	175.3217	528.6063	938.3912	(98a)
Space heating requirement - total per year (kWh/year)												3630.1611	
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	901.6541	565.5119	364.4682	129.1174	27.0903	0.0000	0.0000	0.0000	0.0000	175.3217	528.6063	938.3912	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3630.1611	
Space heating per m2											(98c) / (4) =	28.8108	(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 %) 294.4427 (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	901.6541	565.5119	364.4682	129.1174	27.0903	0.0000	0.0000	0.0000	0.0000	175.3217	528.6063	938.3912	(98)
Space heating efficiency (main heating system 1)	294.4427	294.4427	294.4427	294.4427	294.4427	0.0000	0.0000	0.0000	0.0000	294.4427	294.4427	294.4427	(210)
Space heating fuel (main heating system)	306.2240	192.0618	123.7824	43.8514	9.2005	0.0000	0.0000	0.0000	0.0000	59.5436	179.5277	318.7008	(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												
	287.8954	254.5694	270.1894	236.7531	228.9981	205.7838	202.5984	210.8980	213.5115	238.7760	254.7710	284.6294 (64)
Efficiency of water heater												162.1807 (216)
(217)m	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807	162.1807 (217)
Fuel for water heating, kWh/month												
	177.5152	156.9665	166.5977	145.9810	141.1993	126.8855	124.9214	130.0389	131.6504	147.2284	157.0908	175.5014 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	39.9803	32.0737	28.8788	21.1579	16.3429	13.3523	14.9086	19.3787	25.1711	33.0258	37.3026	41.0915 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1232.8922 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	162.1807
Water heating fuel used	1781.5767 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	322.6643 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	3337.1332 (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	1232.8922	0.1575	194.2232	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1781.5767	0.1410	251.1214	(264)
Space and water heating			445.3446	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	322.6643	0.1443	46.5704	(268)
Total CO2, kg/year			491.9150	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.9000	(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	1232.8922	1.5831	1951.8438	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1781.5767	1.5212	2710.1376	(278)
Space and water heating			4661.9813	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	322.6643	1.5338	494.9133	(282)
Total Primary energy kWh/year			5156.8946	(286)
Dwelling Primary energy Rate (DPER)			40.9300	(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	70.0000 (1b)	x	2.4000 (2b)	=	168.0000 (1b)	-
First floor	56.0000 (1c)	x	2.4000 (2c)	=	134.4000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	126.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	302.4000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1323 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3823 (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) =	0.3249 (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	0.4143	0.4062	0.3980	0.3574	0.3493	0.3087	0.3087	0.3006	0.3249	0.3493	0.3656	0.3818	(22b)
Effective ac	0.5858	0.5825	0.5792	0.5639	0.5610	0.5476	0.5476	0.5452	0.5528	0.5610	0.5668	0.5729	(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 Opening Type (Uw = 1.20)			31.5000	1.1450	36.0687			(27)
Heatloss Floor 1			70.0000	0.1300	9.1000			(28a)
External Wall 1	172.0000	31.5000	140.5000	0.1800	25.2900			(29a)
External Roof 1	14.0000		14.0000	0.1100	1.5400			(30)
External Roof 2	56.0000		56.0000	0.1100	6.1600			(30)
Total net area of external elements Aum(A, m2)			312.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.1587			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			271.9444 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	40.0000	0.1600	6.4000
E6 Intermediate floor within a dwelling	32.0000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	19.7000	0.0500	0.9850
E3 Sill	14.3000	0.0500	0.7150
E4 Jamb	43.9000	0.0500	2.1950
E10 Eaves (insulation at ceiling level)	18.0000	0.0600	1.0800
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.0950 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	90.2537 (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	58.4600	58.1274	57.8015	56.2704	55.9840	54.6505	54.6505	54.4035	55.1641	55.9840	56.5635	57.1693	(38)
Heat transfer coeff	148.7137	148.3811	148.0552	146.5241	146.2377	144.9042	144.9042	144.6572	145.4178	146.2377	146.8172	147.4230	(39)

Average = Sum(39)m / 12 = 146.5228

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1803	1.1776	1.1750	1.1629	1.1606	1.1500	1.1500	1.1481	1.1541	1.1606	1.1652	1.1700	(40)
HLP (average)												1.1629	
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 2.8838 (42)

Hot water usage for mixer showers

	72.5718	71.4812	69.8920	66.8513	64.6073	62.1048	60.6824	62.2596	63.9886	66.6754	69.7815	72.2938 (42a)

Hot water usage for baths

	31.3315	30.8662	30.2109	29.0027	28.0980	27.0949	26.5531	27.2037	27.9122	28.9856	30.2187	31.2256 (42b)

Hot water usage for other uses

	44.1631	42.5572	40.9512	39.3453	37.7394	36.1334	36.1334	37.7394	39.3453	40.9512	42.5572	44.1631 (42c)

Average daily hot water use (litres/day) 136.1063 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.0664	144.9046	141.0541	135.1993	130.4447	125.3332	123.3689	127.2028	131.2461	136.6123	142.5573	147.6825	(44)
Energy conte	234.5010	206.3422	216.7950	185.0811	175.6037	154.1118	149.2040	157.5036	161.8395	185.3816	203.0990	231.2350	(45)
Energy content (annual)										Total = Sum(45)m =		2260.6975	
Distribution loss (46)m = 0.15 x (45)m													
	35.1752	30.9513	32.5192	27.7622	26.3405	23.1168	22.3806	23.6255	24.2759	27.8072	30.4649	34.6853	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	281.0959	248.4279	263.3899	230.1729	222.1986	199.2036	195.7989	204.0985	206.9314	231.9765	248.1909	277.8299	(62)
WWHRS	-33.1768	-29.3418	-30.7251	-25.4416	-23.7107	-20.2894	-19.0181	-20.2238	-20.9922	-24.7474	-28.0359	-32.5624	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	247.9191	219.0860	232.6648	204.7313	198.4879	178.9142	176.7809	183.8747	185.9392	207.2290	220.1550	245.2675	(64)
										Total per year (kWh/year) = Sum(64)m =		2501.0498	(64)
12Total per year (kWh/year)												2501	(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													
	115.2475	102.2773	109.3602	97.6129	95.6641	87.3156	86.8863	89.6459	89.8851	98.9153	103.6039	114.1616	(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	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	144.1905	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	147.7001	163.5251	147.7001	152.6234	147.7001	152.6234	147.7001	147.7001	152.6234	147.7001	152.6234	147.7001	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	292.8319	295.8706	288.2132	271.9116	251.3337	231.9934	219.0729	216.0342	223.6916	239.9932	260.5711	279.9114	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	37.4191	(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)													
	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	-115.3524	(71)
Water heating gains (Table 5)													
	154.9026	152.1984	146.9896	135.5735	128.5808	121.2717	116.7826	120.4918	124.8404	132.9507	143.8943	153.4430	(72)
Total internal gains													
	664.6917	680.8513	652.1600	629.3657	596.8718	572.1457	549.8127	550.4832	567.4126	589.9011	626.3460	650.3116	(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	10.5600	10.6334	0.6300	0.7000	0.7700	34.3169	(74)
East	6.3000	19.6403	0.6300	0.7000	0.7700	37.8146	(76)
South	10.4700	46.7521	0.6300	0.7000	0.7700	149.5958	(78)
West	4.1700	19.6403	0.6300	0.7000	0.7700	25.0297	(80)

Solar gains	246.7569	433.5174	625.9836	826.9984	970.5593	982.3008	939.2876	829.7831	695.4643	488.1955	298.0157	209.5528	(83)
Total gains	911.4487	1114.3687	1278.1437	1456.3641	1567.4311	1554.4465	1489.1004	1380.2662	1262.8768	1078.0966	924.3617	859.8644	(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	64.0026	64.1460	64.2872	64.9590	65.0862	65.6852	65.6852	65.7973	65.4532	65.0862	64.8293	64.5629	
alpha	5.2668	5.2764	5.2858	5.3306	5.3391	5.3790	5.3790	5.3865	5.3635	5.3391	5.3220	5.3042	
util living area	0.9968	0.9904	0.9729	0.9121	0.7770	0.5811	0.4256	0.4771	0.7327	0.9477	0.9919	0.9976	(86)
MIT	19.7534	19.9823	20.2844	20.6471	20.8871	20.9808	20.9970	20.9946	20.9379	20.6036	20.1082	19.7164	(87)
Th 2	19.9358	19.9379	19.9400	19.9498	19.9516	19.9602	19.9602	19.9618	19.9569	19.9516	19.9479	19.9441	(88)
util rest of house	0.9956	0.9870	0.9633	0.8830	0.7157	0.4936	0.3264	0.3721	0.6455	0.9236	0.9884	0.9967	(89)
MIT 2	18.4959	18.7883	19.1688	19.6106	19.8651	19.9506	19.9594	19.9601	19.9197	19.5728	18.9576	18.4546	(90)
Living area fraction										fLA = Living area / (4) =		0.1429	(91)
MIT	18.6755	18.9588	19.3282	19.7586	20.0111	20.0977	20.1076	20.1079	20.0651	19.7200	19.1219	18.6349	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6755	18.9588	19.3282	19.7586	20.0111	20.0977	20.1076	20.1079	20.0651	19.7200	19.1219	18.6349	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9935	0.9826	0.9560	0.8768	0.7195	0.5055	0.3406	0.3871	0.6553	0.9169	0.9845	0.9951	(94)
Useful gains	905.5539	1095.0026	1221.9647	1276.9229	1127.7205	785.8361	507.2315	534.3537	827.5533	988.4859	910.0377	855.6610	(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	2137.8340	2086.0681	1899.2784	1591.0516	1215.3984	796.6458	508.2645	536.3754	867.4339	1333.6933	1765.0269	2128.0348	(97)
Space heating kWh	916.8164	665.9960	503.9213	226.1727	65.2323	0.0000	0.0000	0.0000	0.0000	256.8343	615.5923	946.6461	(98a)
Space heating requirement - total per year (kWh/year)												4197.2114	
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	916.8164	665.9960	503.9213	226.1727	65.2323	0.0000	0.0000	0.0000	0.0000	256.8343	615.5923	946.6461	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4197.2114	
Space heating per m2										(98c) / (4) =		33.3112	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	916.8164	665.9960	503.9213	226.1727	65.2323	0.0000	0.0000	0.0000	0.0000	256.8343	615.5923	946.6461	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	993.3005	721.5558	545.9603	245.0408	70.6742	0.0000	0.0000	0.0000	0.0000	278.2604	666.9472	1025.6187	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	247.9191	219.0860	232.6648	204.7313	198.4879	178.9142	176.7809	183.8747	185.9392	207.2290	220.1550	245.2675	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.7182	86.3883	85.7454	84.2837	81.8520	79.8000	79.8000	79.8000	79.8000	84.5422	86.2379	86.7859	(217)
Fuel for water heating, kWh/month	285.8904	253.6062	271.3438	242.9075	242.4961	224.2033	221.5299	230.4194	233.0065	245.1191	255.2879	282.6122	(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	30.6892	24.6200	22.1676	16.2409	12.5449	10.2493	11.4439	14.8752	19.3215	25.3508	28.6337	31.5421	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-60.6550	-83.1566	-116.2561	-126.9780	-133.7906	-123.6817	-122.0263	-116.6195	-106.7695	-93.1608	-65.7865	-52.7097	(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	-41.8388	-87.0165	-171.1912	-254.6641	-334.4635	-335.3316	-331.4959	-281.8051	-207.9915	-123.7466	-55.6184	-33.1719	(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												4547.3580	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	79.8000
Water heating fuel used	2988.4225 (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)	247.6791 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3459.9254 (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	4409.5341 (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	4547.3580	0.2100	954.9452	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2988.4225	0.2100	627.5687	(264)
Space and water heating			1582.5139	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	247.6791	0.1443	35.7477	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1201.5903	0.1352	-162.4665	
PV Unit electricity exported	-2258.3350	0.1262	-284.9425	
Total			-447.4090	(269)
Total CO2, kg/year			1182.7819	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3900	(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	4547.3580	1.1300	5138.5145	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2988.4225	1.1300	3376.9174	(278)
Space and water heating			8515.4319	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	247.6791	1.5338	379.8985	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1201.5903	1.4997	-1802.0807	
PV Unit electricity exported	-2258.3350	0.4632	-1045.9621	
Total			-2848.0428	(283)
Total Primary energy kWh/year			6177.3884	(286)
Target Primary Energy Rate (TPER)			49.0300	(287)

Full SAP Calculation Printout

Property Reference	House Type G	Issued on Date	05/10/2023
Assessment Reference	Plot 44	Prop Type Ref	
Property			

SAP Rating	81 B	DER	4.41	TER	9.51
Environmental	96 A	% DER < TER			53.63
CO_2 Emissions (t/year)	0.4	DFEE	33.95	TFEE	34.06
Compliance Check	See BREL	% DFEE < TFEE			0.33
% DPER < TPER	5.95	DPER	46.41	TPER	49.35

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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			51.0000 (1b)	x	2.4000 (2b)	=	122.4000 (1b)	-
First floor			48.0000 (1c)	x	2.4000 (2c)	=	115.2000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000							(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.6000	(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		1 * 10	=	10.0000 (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) =		10.0000 / (5)	=	0.0421 (8)
Pressure test		Yes		
Pressure Test Method		Blower Door		
Measured/design AP50		4.0000		(17)
Infiltration rate		0.2421		(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)	=	0.2058 (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	0.2624	0.2572	0.2521	0.2264	0.2212	0.1955	0.1955	0.1903	0.2058	0.2212	0.2315	0.2418	(22b)
Effective ac	0.5344	0.5331	0.5318	0.5256	0.5245	0.5191	0.5191	0.5181	0.5212	0.5245	0.5268	0.5292	(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	
Opening Type 1 (Uw = 1.20)			33.0000	1.1450	37.7863			(27)
Heatloss Floor 1			51.0000	0.1200	6.1200	110.0000	5610.0000	(28a)
External Wall 1	86.4000	33.0000	53.4000	0.1900	10.1460	190.0000	10146.0000	(29a)
External Roof 1	48.0000		48.0000	0.1500	7.2000	9.0000	432.0000	(30)
Total net area of external elements Aum(A, m2)			185.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	61.2523			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 16188.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.5152 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	23.0000	0.0670	1.5410
E6 Intermediate floor within a dwelling	23.0000	0.0020	0.0460
E16 Corner (normal)	9.6000	0.0410	0.3936
E18 Party wall between dwellings	9.6000	0.0400	0.3840
E2 Other lintels (including other steel lintels)	5.2000	0.0240	0.1248
E3 Sill	3.4500	0.0190	0.0655
E4 Jamb	8.9000	0.0140	0.1246
E11 Eaves (insulation at rafter level)	8.2000	0.0110	0.0902
E12 Gable (insulation at ceiling level)	10.0000	0.0330	0.3300

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.0998 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 64.3520 (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	41.9026	41.7978	41.6951	41.2126	41.1224	40.7022	40.7022	40.6244	40.8640	41.1224	41.3050	41.4959	(38)
Heat transfer coeff	106.2546	106.1498	106.0471	105.5646	105.4744	105.0542	105.0542	104.9764	105.2160	105.4744	105.6570	105.8479	(39)

Average = Sum(39)m / 12 = 105.5642

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0733	1.0722	1.0712	1.0663	1.0654	1.0612	1.0612	1.0604	1.0628	1.0654	1.0672	1.0692	(40)
HLP (average)												1.0663	
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 2.7301 (42)
Hot water usage for mixer showers

69.9941	68.9423	67.4095	64.4768	62.3125	59.8989	58.5270	60.0482	61.7157	64.3072	67.3029	69.7260	(42a)

Hot water usage for baths

30.2230	29.7741	29.1421	27.9766	27.1039	26.1363	25.6136	26.2413	26.9247	27.9601	29.1495	30.1208	(42b)

Hot water usage for other uses

42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887	(42c)

Average daily hot water use (litres/day) 131.2707 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	142.8058	139.7564	136.0429	130.3960	125.8104	120.8805	118.9860	122.6835	126.5831	131.7586	137.4924	142.4355	(44)
Energy conte	226.1695	199.0113	209.0928	178.5056	169.3650	148.6367	143.9032	151.9078	156.0896	178.7952	195.8832	223.0195	(45)

Energy content (annual) Total = Sum(45)m = 2180.3794
Distribution loss (46)m = 0.15 x (45)m

33.9254	29.8517	31.3639	26.7758	25.4047	22.2955	21.5855	22.7862	23.4134	26.8193	29.3825	33.4529	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

279.5639	247.2385	262.4872	230.1776	222.7594	200.3087	197.2976	205.3022	207.7616	232.1896	247.5552	276.4139	(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

279.5639	247.2385	262.4872	230.1776	222.7594	200.3087	197.2976	205.3022	207.7616	232.1896	247.5552	276.4139	(64)

Total per year (kWh/year) = Sum(64)m = 2809.0554 (64)
12Total per year (kWh/year) 2809 (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

117.9169	104.7530	112.2389	100.6907	99.0294	90.7593	90.5633	93.2249	93.2374	102.1649	106.4688	116.8695	(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	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	128.4674	142.2317	128.4674	132.7496	128.4674	132.7496	128.4674	128.4674	132.7496	128.4674	132.7496	128.4674	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	(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)	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)

Water heating gains (Table 5)

	158.4904	155.8825	150.8587	139.8482	133.1040	126.0546	121.7249	125.3022	129.4964	137.3184	147.8733	157.0827 (72)

Total internal gains

	605.6098	619.4092	593.9608	573.0537	544.1288	524.5397	504.6897	505.6241	520.7607	538.4795	571.2149	592.9640 (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	12.2000	10.6334	0.7600	0.7000	0.7700	47.8274 (74)
East	9.3000	19.6403	0.7600	0.7000	0.7700	67.3403 (76)
South	1.8000	46.7521	0.7600	0.7000	0.7700	31.0255 (78)
West	9.7000	19.6403	0.7600	0.7000	0.7700	70.2367 (80)

Solar gains	216.4298	411.3420	663.2554	969.0317	1204.4870	1244.0778	1179.6240	999.2803	769.8295	482.9508	267.3193	179.8167 (83)
Total gains	822.0396	1030.7512	1257.2162	1542.0854	1748.6159	1768.6175	1684.3138	1504.9043	1290.5903	1021.4302	838.5342	772.7807 (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	42.3197	42.3615	42.4026	42.5963	42.6328	42.8033	42.8033	42.8350	42.7375	42.6328	42.5591	42.4824	
alpha	3.8213	3.8241	3.8268	3.8398	3.8422	3.8536	3.8536	3.8557	3.8492	3.8422	3.8373	3.8322	
util living area	0.9709	0.9371	0.8642	0.7130	0.5325	0.3744	0.2731	0.3181	0.5339	0.8208	0.9465	0.9764	(86)
Living	19.5164	19.8705	20.3141	20.7292	20.9243	20.9846	20.9965	20.9937	20.9437	20.6063	19.9727	19.4427	
Non living	18.3120	18.7529	19.2904	19.7657	19.9663	20.0230	20.0312	20.0305	19.9917	19.6482	18.8904	18.2217	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.2410	19.8705	20.3141	20.7292	20.9243	20.9846	20.9965	20.9937	20.9437	20.6063	19.9727	19.6605	(87)
Th 2	20.0227	20.0236	20.0244	20.0284	20.0292	20.0327	20.0327	20.0333	20.0313	20.0292	20.0277	20.0261	(88)
util rest of house	0.9651	0.9254	0.8415	0.6746	0.4840	0.3199	0.2137	0.2525	0.4679	0.7828	0.9344	0.9715	(89)
MIT 2	19.3407	18.7529	19.2904	19.7657	19.9663	20.0230	20.0312	20.0305	19.9917	19.6482	18.8904	18.5469	(90)
Living area fraction									fLA = Living area / (4) =			0.2626	(91)
MIT	19.5772	19.0464	19.5593	20.0188	20.2179	20.2755	20.2847	20.2835	20.2417	19.8998	19.1746	18.8394	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5772	19.0464	19.5593	20.0188	20.2179	20.2755	20.2847	20.2835	20.2417	19.8998	19.1746	18.8394	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9619	0.9112	0.8293	0.6742	0.4936	0.3337	0.2292	0.2696	0.4826	0.7771	0.9212	0.9639	(94)
Useful gains	790.7271	939.1758	1042.6302	1039.6564	863.2039	590.2192	386.0636	405.7382	622.8841	793.7690	772.4244	744.8817	(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	1623.2693	1501.6402	1384.8972	1173.7478	898.4171	596.2361	387.0960	407.6744	646.2092	980.8914	1275.7696	1549.5442	(97)
Space heating kWh	619.4114	377.9760	254.6466	96.5458	26.1986	0.0000	0.0000	0.0000	0.0000	139.2191	362.4085	598.6689	(98a)
Space heating requirement - total per year (kWh/year)												2475.0749	
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	619.4114	377.9760	254.6466	96.5458	26.1986	0.0000	0.0000	0.0000	0.0000	139.2191	362.4085	598.6689	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2475.0749	
Space heating per m2											(98c) / (4) =	25.0008	(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 %) 261.1634 (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	619.4114	377.9760	254.6466	96.5458	26.1986	0.0000	0.0000	0.0000	0.0000	139.2191	362.4085	598.6689	(98)
Space heating efficiency (main heating system 1)	261.1634	261.1634	261.1634	261.1634	261.1634	0.0000	0.0000	0.0000	0.0000	261.1634	261.1634	261.1634	(210)
Space heating fuel (main heating system)	237.1739	144.7278	97.5047	36.9676	10.0315	0.0000	0.0000	0.0000	0.0000	53.3073	138.7670	229.2315	(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

279.5639	247.2385	262.4872	230.1776	222.7594	200.3087	197.2976	205.3022	207.7616	232.1896	247.5552	276.4139 (64)

Efficiency of water heater

											159.9572 (216)
(217)m	159.9572	159.9572	159.9572	159.9572	159.9572	159.9572	159.9572	159.9572	159.9572	159.9572	159.9572 (217)

Fuel for water heating, kWh/month

174.7742	154.5654	164.0984	143.8995	139.2619	125.2264	123.3440	128.3482	129.8857	145.1573	154.7634	172.8050 (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 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	34.3173	27.5306	24.7883	18.1610	14.0281	11.4610	12.7969	16.6338	21.6057	28.3479	32.0188	35.2711 (232)

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

(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

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

(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	947.7112 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	159.9572
Water heating fuel used	1756.1296 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	276.9606 (232)

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

PV generation	0.0000 (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	2980.8014 (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	947.7112	0.1571	148.9129	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1756.1296	0.1409	247.5032	(264)
Space and water heating			396.4161	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	276.9606	0.1443	39.9740	(268)
Total CO2, kg/year			436.3901	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4100	(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	947.7112	1.5816	1498.9290	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1756.1296	1.5211	2671.3100	(278)
Space and water heating			4170.2390	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	276.9606	1.5338	424.8113	(282)
Total Primary energy kWh/year			4595.0504	(286)
Dwelling Primary energy Rate (DPER)			46.4100	(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	51.0000 (1b)	x	2.4000 (2b)	=	122.4000 (1b)	-
First floor	48.0000 (1c)	x	2.4000 (2c)	=	115.2000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.6000	(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) =	0.1263 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3763 (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) =	0.3198 (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	0.4078	0.3998	0.3918	0.3518	0.3438	0.3038	0.3038	0.2958	0.3198	0.3438	0.3598	0.3758	(22b)
Effective ac	0.5831	0.5799	0.5767	0.5619	0.5591	0.5462	0.5462	0.5438	0.5511	0.5591	0.5647	0.5706	(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 Opening Type (Uw = 1.20)			24.7600	1.1450	28.3511			(27)
Heatloss Floor 1			51.0000	0.1300	6.6300			(28a)
External Wall 1	86.4000	24.7600	61.6400	0.1800	11.0952			(29a)
External Roof 1	48.0000		48.0000	0.1100	5.2800			(30)
Total net area of external elements Aum(A, m2)			185.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	51.3563			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 163.5152 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	23.0000	0.1600	3.6800
E6 Intermediate floor within a dwelling	23.0000	0.0000	0.0000
E16 Corner (normal)	9.6000	0.0900	0.8640
E18 Party wall between dwellings	9.6000	0.0600	0.5760
E2 Other lintels (including other steel lintels)	5.2000	0.0500	0.2600
E3 Sill	3.4500	0.0500	0.1725
E4 Jamb	8.9000	0.0500	0.4450
E11 Eaves (insulation at rafter level)	8.2000	0.0400	0.3280
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.9255 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =		58.2818 (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	45.7228	45.4697	45.2216	44.0562	43.8381	42.8231	42.8231	42.6351	43.2141	43.8381	44.2792	44.7404	(38)
Heat transfer coeff	104.0047	103.7516	103.5034	102.3380	102.1200	101.1049	101.1049	100.9169	101.4959	102.1200	102.5611	103.0222	(39)
Average = Sum(39)m / 12 =												102.3370	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0506	1.0480	1.0455	1.0337	1.0315	1.0213	1.0213	1.0194	1.0252	1.0315	1.0360	1.0406	(40)
HLP (average)												1.0337	
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 2.7301 (42)

Hot water usage for mixer showers

69.9941	68.9423	67.4095	64.4768	62.3125	59.8989	58.5270	60.0482	61.7157	64.3072	67.3029	69.7260 (42a)

Hot water usage for baths

30.2230	29.7741	29.1421	27.9766	27.1039	26.1363	25.6136	26.2413	26.9247	27.9601	29.1495	30.1208 (42b)

Hot water usage for other uses

42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887 (42c)

Average daily hot water use (litres/day) 131.2707 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	142.8058	139.7564	136.0429	130.3960	125.8104	120.8805	118.9860	122.6835	126.5831	131.7586	137.4924	142.4355	(44)
Energy conte	226.1695	199.0113	209.0928	178.5056	169.3650	148.6367	143.9032	151.9078	156.0896	178.7952	195.8832	223.0195	(45)
Energy content (annual)										Total = Sum(45)m =		2180.3794	
Distribution loss (46)m = 0.15 x (45)m													
	33.9254	29.8517	31.3639	26.7758	25.4047	22.2955	21.5855	22.7862	23.4134	26.8193	29.3825	33.4529	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	272.7644	241.0970	255.6877	223.5975	215.9599	193.7285	190.4981	198.5027	201.1814	225.3901	240.9750	269.6144	(62)
WWHRS	-31.9984	-28.2996	-29.6338	-24.5379	-22.8685	-19.5687	-18.3425	-19.5055	-20.2465	-23.8684	-27.0400	-31.4058	(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													
	240.7660	212.7973	226.0540	199.0596	193.0914	174.1598	172.1556	178.9972	180.9349	201.5217	213.9350	238.2086	(64)
										Total per year (kWh/year) = Sum(64)m =		2431.6811	(64)
12Total per year (kWh/year)												2432	(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													
	112.4773	99.8398	106.7993	95.4266	93.5898	85.4952	85.1237	87.7853	87.9733	96.7253	101.2046	111.4299	(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	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	128.4674	142.2317	128.4674	132.7496	128.4674	132.7496	128.4674	128.4674	132.7496	128.4674	132.7496	128.4674	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	(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)													
	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)
Water heating gains (Table 5)													
	151.1792	148.5712	143.5474	132.5369	125.7927	118.7433	114.4136	117.9909	122.1851	130.0072	140.5620	149.7714	(72)
Total internal gains													
	601.2985	615.0979	589.6495	568.7424	539.8176	517.2284	497.3785	498.3128	513.4494	534.1682	566.9036	588.6527	(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	9.1500	10.6334	0.6300	0.7000	0.7700	29.7348	(74)
East	6.9800	19.6403	0.6300	0.7000	0.7700	41.8962	(76)
South	1.3500	46.7521	0.6300	0.7000	0.7700	19.2889	(78)
West	7.2800	19.6403	0.6300	0.7000	0.7700	43.6969	(80)

Solar gains	134.6167	255.8531	412.5462	602.7392	749.1879	773.8101	733.7215	621.5524	478.8360	300.3949	166.2701	111.8433	(83)
Total gains	735.9153	870.9510	1002.1958	1171.4816	1289.0055	1291.0385	1231.1000	1119.8652	992.2855	834.5631	733.1737	700.4960	(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	43.2352	43.3407	43.4446	43.9394	44.0332	44.4753	44.4753	44.5581	44.3039	44.0332	43.8438	43.6475	
alpha	3.8823	3.8894	3.8963	3.9293	3.9355	3.9650	3.9650	3.9705	3.9536	3.9355	3.9229	3.9098	
util living area	0.9791	0.9603	0.9200	0.8186	0.6619	0.4845	0.3572	0.4071	0.6421	0.8808	0.9628	0.9825	(86)
MIT	19.4466	19.7244	20.1142	20.5712	20.8518	20.9668	20.9922	20.9871	20.9028	20.4977	19.8958	19.4024	(87)
Th 2	20.0414	20.0435	20.0456	20.0553	20.0572	20.0657	20.0657	20.0672	20.0624	20.0572	20.0535	20.0496	(88)
util rest of house	0.9748	0.9524	0.9044	0.7867	0.6113	0.4194	0.2832	0.3277	0.5730	0.8511	0.9540	0.9788	(89)
MIT 2	18.2374	18.5879	19.0723	19.6220	19.9281	20.0437	20.0622	20.0612	19.9902	19.5536	18.8150	18.1870	(90)
Living area fraction										fLA = Living area / (4) =		0.2626	(91)
MIT	18.5549	18.8864	19.3459	19.8713	20.1707	20.2861	20.3065	20.3044	20.2298	19.8016	19.0989	18.5062	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5549	18.8864	19.3459	19.8713	20.1707	20.2861	20.3065	20.3044	20.2298	19.8016	19.0989	18.5062	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9657	0.9402	0.8908	0.7799	0.6177	0.4351	0.3025	0.3482	0.5860	0.8417	0.9425	0.9706	(94)
Useful gains	710.6565	818.8447	892.7427	913.5988	796.2088	561.7624	372.4043	389.9569	581.4761	702.4859	691.0210	679.9053	(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	1482.5791	1451.1114	1329.5995	1122.7778	865.0281	574.8977	374.7438	394.0155	622.1535	939.6638	1230.6170	1473.8580	(97)
Space heating kWh	574.3104	424.8832	325.0214	150.6089	51.2015	0.0000	0.0000	0.0000	0.0000	176.4604	388.5091	590.7009	(98a)
Space heating requirement - total per year (kWh/year)												2681.6959	
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	574.3104	424.8832	325.0214	150.6089	51.2015	0.0000	0.0000	0.0000	0.0000	176.4604	388.5091	590.7009	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2681.6959	
Space heating per m2											(98c) / (4) =	27.0878	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 92.3000 (206)
Efficiency of main space heating system 2 (in %) 0.0000 (207)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	574.3104	424.8832	325.0214	150.6089	51.2015	0.0000	0.0000	0.0000	0.0000	176.4604	388.5091	590.7009	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	622.2214	460.3285	352.1359	163.1733	55.4730	0.0000	0.0000	0.0000	0.0000	191.1814	420.9199	639.9793	(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	240.7660	212.7973	226.0540	199.0596	193.0914	174.1598	172.1556	178.9972	180.9349	201.5217	213.9350	238.2086	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9370	85.5791	84.8734	83.4426	81.5319	79.8000	79.8000	79.8000	79.8000	83.7633	85.3805	86.0123	(217)
Fuel for water heating, kWh/month	280.1656	248.6556	266.3424	238.5587	236.8292	218.2454	215.7338	224.3073	226.7354	240.5846	250.5666	276.9472	(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	26.6930	21.4141	19.2810	14.1261	10.9114	8.9147	9.9538	12.9383	16.8055	22.0498	24.9052	27.4349	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-46.3462	-64.6534	-91.9656	-102.2788	-109.3270	-101.6637	-100.3504	-95.1619	-85.9229	-73.3366	-50.6846	-40.1453	(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	-28.3279	-59.3299	-117.4603	-175.7747	-231.8296	-232.7602	-230.0729	-195.1189	-143.4029	-84.6959	-37.7676	-22.4256	(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												2905.4126	(211)

Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2923.6719 (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)	215.4276 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2520.8028 (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	3609.7094 (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	2905.4126	0.2100	610.1367	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2923.6719	0.2100	613.9711	(264)
Space and water heating			1224.1078	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	215.4276	0.1443	31.0929	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-961.8364	0.1348	-129.6768	
PV Unit electricity exported	-1558.9664	0.1260	-196.4283	
Total			-326.1052	(269)
Total CO2, kg/year			941.0247	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5100	(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	2905.4126	1.1300	3283.1163	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2923.6719	1.1300	3303.7492	(278)
Space and water heating			6586.8655	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	215.4276	1.5338	330.4301	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-961.8364	1.4983	-1441.1127	
PV Unit electricity exported	-1558.9664	0.4625	-721.0338	
Total			-2162.1465	(283)
Total Primary energy kWh/year			4885.2499	(286)
Target Primary Energy Rate (TPER)			49.3500	(287)

Full SAP Calculation Printout

Property Reference	House Type G	Issued on Date	05/10/2023
Assessment Reference	Plot 45	Prop Type Ref	
Property			

SAP Rating	89 B	DER	1.86	TER	5.02
Environmental	98 A	% DER < TER			62.95
CO_2 Emissions (t/year)	0.78	DFEE	18.83	TFEE	19.78
Compliance Check	See BREL	% DFEE < TFEE			4.80
% DPER < TPER	27.60	DPER	19.35	TPER	26.72

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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		41.0000	(1b)	x 2.4000	(2b) =	98.4000	(1b) -
First floor		410.0000	(1c)	x 2.4000	(2c) =	984.0000	(1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	451.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1082.4000	(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			1 * 10 =	10.0000 (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) =			10.0000 / (5) =	0.0092 (8)
Pressure test				Yes
Pressure Test Method				Blower Door
Measured/design AP50				4.0000 (17)
Infiltration rate				0.2092 (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) =	0.1779 (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	0.2268	0.2223	0.2179	0.1956	0.1912	0.1690	0.1690	0.1645	0.1779	0.1912	0.2001	0.2090	(22b)
Effective ac	0.5257	0.5247	0.5237	0.5191	0.5183	0.5143	0.5143	0.5135	0.5158	0.5183	0.5200	0.5218	(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	
Opening Type 1 (Uw = 1.20)			20.6000	1.1450	23.5878			(27)
Heatloss Floor 1			41.0000	0.1200	4.9200	110.0000	4510.0000	(28a)
External Wall 1	86.0000	20.6000	65.4000	0.1900	12.4260	190.0000	12426.0000	(29a)
External Roof 1	41.0000		41.0000	0.1500	6.1500	9.0000	369.0000	(30)
Total net area of external elements Aum(A, m2)			168.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.0838			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17305.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 38.3703 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	18.0000	0.0670	1.2060
E6 Intermediate floor within a dwelling	18.0000	0.0020	0.0360
E16 Corner (normal)	9.6000	0.0410	0.3936
E18 Party wall between dwellings	9.6000	0.0400	0.3840
E2 Other lintels (including other steel lintels)	5.2000	0.0240	0.1248
E3 Sill	3.4500	0.0190	0.0655
E4 Jamb	8.9000	0.0140	0.1246
E11 Eaves (insulation at rafter level)	8.2000	0.0110	0.0902
E12 Gable (insulation at ceiling level)	10.0000	0.0330	0.3300

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.7548 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 49.8385 (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	187.7796	187.4230	187.0735	185.4316	185.1245	183.6945	183.6945	183.4297	184.2453	185.1245	185.7459	186.3955	(38)
Heat transfer coeff	237.6182	237.2615	236.9120	235.2702	234.9630	233.5330	233.5330	233.2682	234.0838	234.9630	235.5844	236.2341	(39)

Average = Sum(39)m / 12 = 235.2687

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5269	0.5261	0.5253	0.5217	0.5210	0.5178	0.5178	0.5172	0.5190	0.5210	0.5224	0.5238	(40)
HLP (average)												0.5217	
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 3.3282 (42)
Hot water usage for mixer showers

80.0234	78.8208	77.0684	73.7155	71.2411	68.4817	66.9132	68.6524	70.5588	73.5216	76.9466	79.7168	(42a)

Hot water usage for baths

34.5359	34.0230	33.3007	31.9690	30.9718	29.8660	29.2688	29.9860	30.7669	31.9501	33.3093	34.4192	(42b)

Hot water usage for other uses

48.7144	46.9430	45.1715	43.4001	41.6287	39.8572	39.8572	41.6287	43.4001	45.1715	46.9430	48.7144	(42c)

Average daily hot water use (litres/day) 150.0850 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	163.2737	159.7868	155.5407	149.0846	143.8415	138.2050	136.0392	140.2671	144.7259	150.6432	157.1988	162.8504	(44)
Energy conte	258.5857	227.5343	239.0602	204.0893	193.6384	169.9391	164.5277	173.6799	178.4615	204.4215	223.9585	254.9844	(45)

Energy content (annual) Total = Sum(45)m = 2492.8804
Distribution loss (46)m = 0.15 x (45)m

38.7879	34.1301	35.8590	30.6134	29.0458	25.4909	24.6792	26.0520	26.7692	30.6632	33.5938	38.2477	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

311.9801	275.7615	292.4546	255.7613	247.0328	221.6111	217.9221	227.0743	230.1335	257.8159	275.6305	308.3788	(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

311.9801	275.7615	292.4546	255.7613	247.0328	221.6111	217.9221	227.0743	230.1335	257.8159	275.6305	308.3788	(64)

Total per year (kWh/year) = Sum(64)m = 3121.5564 (64)
12Total per year (kWh/year) 3122 (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

128.6953	114.2369	122.2030	109.1973	107.1003	97.8424	97.4210	100.4641	100.6760	110.6857	115.8038	127.4978	(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	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	378.9843	419.5897	378.9843	391.6171	378.9843	391.6171	378.9843	378.9843	391.6171	378.9843	391.6171	378.9843	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	571.5124	577.4429	562.4982	530.6827	490.5214	452.7754	427.5588	421.6282	436.5729	468.3884	508.5498	546.2958	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	(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)	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	(71)

Water heating gains (Table 5)

	172.9775	169.9954	164.2514	151.6629	143.9520	135.8922	130.9422	135.0324	139.8278	148.7710	160.8386	171.3680 (72)

Total internal gains

	1196.3976	1239.9515	1178.6573	1146.8862	1086.3811	1053.2081	1010.4086	1008.5684	1040.9413	1069.0672	1133.9289	1169.5715 (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
East	5.8000	19.6403	0.7600	0.7000	0.7700	41.9972 (76)
South	5.3000	46.7521	0.7600	0.7000	0.7700	91.3527 (78)
West	9.5000	19.6403	0.7600	0.7000	0.7700	68.7885 (80)

Solar gains	202.1384	366.3325	547.4869	735.9244	862.3830	869.0401	832.7662	739.0042	614.1809	418.5277	246.4209	170.0419 (83)
Total gains	1398.5360	1606.2840	1726.1442	1882.8105	1948.7641	1922.2482	1843.1748	1747.5725	1655.1222	1487.5949	1380.3498	1339.6134 (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	20.2297	20.2601	20.2900	20.4316	20.4583	20.5836	20.5836	20.6069	20.5351	20.4583	20.4043	20.3482	
alpha	2.3486	2.3507	2.3527	2.3621	2.3639	2.3722	2.3722	2.3738	2.3690	2.3639	2.3603	2.3565	
util living area	0.9423	0.9200	0.8906	0.8302	0.7418	0.6110	0.4858	0.5218	0.6945	0.8509	0.9203	0.9474	(86)
Living	18.1010	18.4364	18.9212	19.5897	20.1870	20.6473	20.8544	20.8222	20.4873	19.7052	18.7994	18.0395	
Non living	16.9375	17.3643	17.9810	18.8273	19.5728	20.1325	20.3692	20.3360	19.9468	18.9803	17.8317	16.8607	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	15	0	0	0	0	0	0	0	0	0	31	
16 / 9	0	13	31	8	0	0	0	0	0	0	30	0	
MIT	21.0000	20.3259	19.8226	19.7528	20.1870	20.6473	20.8544	20.8222	20.4873	19.7052	19.7536	21.0000	(87)
Th 2	20.4963	20.4970	20.4977	20.5010	20.5016	20.5045	20.5045	20.5051	20.5034	20.5016	20.5004	20.4991	(88)
util rest of house	0.9389	0.9153	0.8838	0.8190	0.7233	0.5805	0.4428	0.4796	0.6676	0.8389	0.9149	0.9442	(89)
MIT 2	20.4963	19.8550	19.3869	19.0766	19.5728	20.1325	20.3692	20.3360	19.9468	18.9803	19.3225	20.4991	(90)
Living area fraction										fLA = Living area / (4) =		0.0355	(91)
MIT	20.5141	19.8717	19.4023	19.1006	19.5946	20.1508	20.3864	20.3532	19.9660	19.0060	19.3378	20.5168	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.5141	19.8717	19.4023	19.1006	19.5946	20.1508	20.3864	20.3532	19.9660	19.0060	19.3378	20.5168	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9390	0.9088	0.8669	0.7822	0.6852	0.5571	0.4320	0.4659	0.6352	0.7945	0.8999	0.9443	(94)
Useful gains	1313.2224	1459.8153	1496.4563	1472.7793	1335.2926	1070.7889	796.3137	814.1649	1051.3095	1181.9184	1242.2380	1265.0421	(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	3852.7727	3552.2141	3056.7192	2399.8905	1854.9306	1296.2908	884.2518	922.1615	1373.1295	1975.1066	2883.0332	3854.5926	(97)
Space heating kWh	1889.4254	1406.0920	1160.8356	667.5200	386.6106	0.0000	0.0000	0.0000	0.0000	590.1320	1181.3725	1926.6256	(98a)
Space heating requirement - total per year (kWh/year)												9208.6137	
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	1889.4254	1406.0920	1160.8356	667.5200	386.6106	0.0000	0.0000	0.0000	0.0000	590.1320	1181.3725	1926.6256	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9208.6137	
Space heating per m2										(98c) / (4) =		20.4182	(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 %)	318.8208 (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	1889.4254	1406.0920	1160.8356	667.5200	386.6106	0.0000	0.0000	0.0000	0.0000	590.1320	1181.3725	1926.6256	(98)
Space heating efficiency (main heating system 1)	318.8208	318.8208	318.8208	318.8208	318.8208	0.0000	0.0000	0.0000	0.0000	318.8208	318.8208	318.8208	(210)
Space heating fuel (main heating system)	592.6293	441.0289	364.1028	209.3715	121.2627	0.0000	0.0000	0.0000	0.0000	185.0983	370.5444	604.2973	(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												
	311.9801	275.7615	292.4546	255.7613	247.0328	221.6111	217.9221	227.0743	230.1335	257.8159	275.6305	308.3788 (64)
Efficiency of water heater												165.8885 (216)
(217)m	165.8885	165.8885	165.8885	165.8885	165.8885	165.8885	165.8885	165.8885	165.8885	165.8885	165.8885	165.8885 (217)
Fuel for water heating, kWh/month												
	188.0662	166.2331	176.2959	154.1767	148.9150	133.5904	131.3666	136.8837	138.7278	155.4152	166.1541	185.8952 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	106.1479	85.1558	76.6733	56.1742	43.3905	35.4504	39.5823	51.4506	66.8292	87.6835	99.0383	109.0980 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	2888.3352 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	165.8885
Water heating fuel used	1881.7200 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	856.6740 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	5626.7292 (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	2888.3352	0.1553	448.4438	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1881.7200	0.1410	265.3244	(264)
Space and water heating			713.7681	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	856.6740	0.1443	123.6445	(268)
Total CO2, kg/year			837.4127	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.8600	(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	2888.3352	1.5748	4548.5094	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1881.7200	1.5214	2862.8028	(278)
Space and water heating			7411.3121	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	856.6740	1.5338	1313.9951	(282)
Total Primary energy kWh/year			8725.3073	(286)
Dwelling Primary energy Rate (DPER)			19.3500	(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	41.0000 (1b)	x	2.4000 (2b)	=	98.4000 (1b)	-
First floor	410.0000 (1c)	x	2.4000 (2c)	=	984.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	451.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1082.4000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0370 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2870 (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) =	0.2439 (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	0.3110	0.3049	0.2988	0.2683	0.2622	0.2317	0.2317	0.2256	0.2439	0.2622	0.2744	0.2866	(22b)
Effective ac	0.5484	0.5465	0.5446	0.5360	0.5344	0.5268	0.5268	0.5255	0.5297	0.5344	0.5376	0.5411	(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 Opening Type (Uw = 1.20)			20.6000	1.1450	23.5878			(27)
Heatloss Floor 1			41.0000	0.1300	5.3300			(28a)
External Wall 1	86.0000	20.6000	65.4000	0.1800	11.7720			(29a)
External Roof 1	41.0000		41.0000	0.1100	4.5100			(30)
Total net area of external elements Aum(A, m2)			168.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.1998			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 38.3703 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	18.0000	0.1600	2.8800
E6 Intermediate floor within a dwelling	18.0000	0.0000	0.0000
E16 Corner (normal)	9.6000	0.0900	0.8640
E18 Party wall between dwellings	9.6000	0.0600	0.5760
E2 Other lintels (including other steel lintels)	5.2000	0.0500	0.2600
E3 Sill	3.4500	0.0500	0.1725
E4 Jamb	8.9000	0.0500	0.4450
E11 Eaves (insulation at rafter level)	8.2000	0.0400	0.3280
E12 Gable (insulation at ceiling level)	10.0000	0.0600	0.6000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.1255 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	51.3253 (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	195.8686	195.1979	194.5404	191.4525	190.8747	188.1852	188.1852	187.6872	189.2212	190.8747	192.0435	193.2654	(38)
Heat transfer coeff	247.1939	246.5232	245.8657	242.7778	242.2000	239.5105	239.5105	239.0125	240.5465	242.2000	243.3688	244.5907	(39)
Average = Sum(39)m / 12 =												242.7750	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5481	0.5466	0.5452	0.5383	0.5370	0.5311	0.5311	0.5300	0.5334	0.5370	0.5396	0.5423	(40)
HLP (average)												0.5383	
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 3.3282 (42)

Hot water usage for mixer showers

80.0234	78.8208	77.0684	73.7155	71.2411	68.4817	66.9132	68.6524	70.5588	73.5216	76.9466	79.7168 (42a)

Hot water usage for baths

34.5359	34.0230	33.3007	31.9690	30.9718	29.8660	29.2688	29.9860	30.7669	31.9501	33.3093	34.4192 (42b)

Hot water usage for other uses

48.7144	46.9430	45.1715	43.4001	41.6287	39.8572	39.8572	41.6287	43.4001	45.1715	46.9430	48.7144 (42c)

Average daily hot water use (litres/day) 150.0850 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	163.2737	159.7868	155.5407	149.0846	143.8415	138.2050	136.0392	140.2671	144.7259	150.6432	157.1988	162.8504	(44)
Energy conte	258.5857	227.5343	239.0602	204.0893	193.6384	169.9391	164.5277	173.6799	178.4615	204.4215	223.9585	254.9844	(45)
Energy content (annual)											Total = Sum(45)m =	2492.8804	
Distribution loss (46)m = 0.15 x (45)m													
	38.7879	34.1301	35.8590	30.6134	29.0458	25.4909	24.6792	26.0520	26.7692	30.6632	33.5938	38.2477	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	305.1806	269.6200	285.6551	249.1811	240.2333	215.0310	211.1226	220.2748	223.5533	251.0164	269.0504	301.5793	(62)
WWHRS	-36.5834	-32.3546	-33.8799	-28.0539	-26.1452	-22.3727	-20.9708	-22.3003	-23.1476	-27.2885	-30.9145	-35.9059	(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													
	268.5972	237.2654	251.7752	221.1272	214.0880	192.6583	190.1518	197.9745	200.4057	223.7279	238.1358	265.6734	(64)
											Total per year (kWh/year) = Sum(64)m =	2701.5804	(64)
12Total per year (kWh/year)												2702	(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													
	123.2557	109.3237	116.7634	103.9332	101.6607	92.5782	91.9814	95.0245	95.4119	105.2461	110.5397	122.0582	(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	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	166.4115	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	378.9843	419.5897	378.9843	391.6171	378.9843	391.6171	378.9843	378.9843	391.6171	378.9843	391.6171	378.9843	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	571.5124	577.4429	562.4982	530.6827	490.5214	452.7754	427.5588	421.6282	436.5729	468.3884	508.5498	546.2958	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	39.6411	(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)													
	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	-133.1292	(71)
Water heating gains (Table 5)													
	165.6662	162.6841	156.9401	144.3516	136.6407	128.5809	123.6309	127.7211	132.5165	141.4598	153.5273	164.0567	(72)
Total internal gains													
	1192.0863	1235.6402	1174.3461	1142.5749	1082.0698	1045.8968	1003.0974	1001.2571	1033.6300	1064.7559	1129.6176	1165.2602	(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	
East	5.8000	19.6403	0.6300	0.7000	0.7700	34.8135	(76)
South	5.3000	46.7521	0.6300	0.7000	0.7700	75.7266	(78)
West	9.5000	19.6403	0.6300	0.7000	0.7700	57.0220	(80)

Solar gains	167.5621	303.6704	453.8378	610.0426	714.8701	720.3885	690.3193	612.5956	509.1236	346.9374	204.2699	140.9558	(83)
Total gains	1359.6484	1539.3106	1628.1839	1752.6175	1796.9399	1766.2853	1693.4167	1613.8526	1542.7536	1411.6933	1333.8876	1306.2160	(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	19.4461	19.4990	19.5511	19.7998	19.8470	20.0699	20.0699	20.1117	19.9834	19.8470	19.7517	19.6530	
alpha	2.2964	2.2999	2.3034	2.3200	2.3231	2.3380	2.3380	2.3408	2.3322	2.3231	2.3168	2.3102	
util living area	0.9463	0.9275	0.9034	0.8516	0.7734	0.6494	0.5247	0.5589	0.7250	0.8659	0.9265	0.9506	(86)
MIT	17.9462	18.2655	18.7439	19.4343	20.0643	20.5795	20.8199	20.7845	20.4112	19.5939	18.6764	17.9036	(87)
Th 2	20.4769	20.4783	20.4796	20.4858	20.4870	20.4924	20.4924	20.4934	20.4903	20.4870	20.4846	20.4822	(88)
util rest of house	0.9430	0.9231	0.8971	0.8412	0.7557	0.6187	0.4796	0.5152	0.6986	0.8546	0.9213	0.9475	(89)
MIT 2	16.7309	17.1379	17.7477	18.6250	19.4150	20.0470	20.3243	20.2876	19.8491	18.8334	17.6676	16.6791	(90)
Living area fraction										fLA = Living area / (4) =		0.0355	(91)
MIT	16.7740	17.1779	17.7830	18.6537	19.4381	20.0659	20.3419	20.3053	19.8690	18.8604	17.7034	16.7225	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.7740	17.1779	17.7830	18.6537	19.4381	20.0659	20.3419	20.3053	19.8690	18.8604	17.7034	16.7225	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9086	0.8837	0.8538	0.7954	0.7136	0.5905	0.4653	0.4977	0.6620	0.8091	0.8821	0.9149	(94)
Useful gains	1235.3455	1360.3550	1390.1428	1393.9678	1282.3759	1042.9926	787.9792	803.2763	1021.3800	1142.2551	1176.5622	1194.9936	(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	3083.4945	3026.7839	2774.1039	2367.9935	1874.1572	1309.1465	896.2268	933.4075	1387.7182	2000.6651	2580.5444	3062.8938	(97)
Space heating kWh	1375.0228	1119.8402	1029.6671	701.2985	440.2853	0.0000	0.0000	0.0000	0.0000	638.6571	1010.8673	1389.7177	(98a)
Space heating requirement - total per year (kWh/year)												7705.3560	
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	1375.0228	1119.8402	1029.6671	701.2985	440.2853	0.0000	0.0000	0.0000	0.0000	638.6571	1010.8673	1389.7177	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7705.3560	
Space heating per m2										(98c) / (4) =		17.0850	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1375.0228	1119.8402	1029.6671	701.2985	440.2853	0.0000	0.0000	0.0000	0.0000	638.6571	1010.8673	1389.7177	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	1489.7322	1213.2613	1115.5656	759.8034	477.0155	0.0000	0.0000	0.0000	0.0000	691.9362	1095.1975	1505.6530	(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	268.5972	237.2654	251.7752	221.1272	214.0880	192.6583	190.1518	197.9745	200.4057	223.7279	238.1358	265.6734	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.1930	87.0829	86.8749	86.4624	85.6400	79.8000	79.8000	79.8000	79.8000	86.2757	86.9307	87.2213	(217)
Fuel for water heating, kWh/month	308.0492	272.4592	289.8135	255.7497	249.9859	241.4264	238.2854	248.0883	251.1349	259.3175	273.9375	304.5970	(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	78.7454	63.1725	56.8799	41.6726	32.1891	26.2988	29.3640	38.1684	49.5770	65.0477	73.4713	80.9340	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.1662	-67.5546	-102.8450	-122.5526	-138.0756	-130.8677	-129.1767	-119.0167	-102.1493	-80.2066	-50.9883	-38.6035	(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	-14.8659	-32.1183	-65.5170	-100.9806	-136.1876	-137.9830	-136.4577	-114.3463	-82.2107	-46.8392	-20.1203	-11.6986	(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												8348.1647	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	79.8000
Water heating fuel used	3192.8445 (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)	635.5209 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2026.5277 (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	10236.0023 (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	8348.1647	0.2100	1753.1146	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3192.8445	0.2100	670.4973	(264)
Space and water heating			2423.6119	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	635.5209	0.1443	91.7253	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1127.2027	0.1334	-150.3916	
PV Unit electricity exported	-899.3251	0.1251	-112.5263	
Total			-262.9180	(269)
Total CO2, kg/year			2264.3485	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			5.0200	(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	8348.1647	1.1300	9433.4261	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3192.8445	1.1300	3607.9143	(278)
Space and water heating			13041.3403	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	635.5209	1.5338	974.7831	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1127.2027	1.4930	-1682.9503	
PV Unit electricity exported	-899.3251	0.4592	-413.0128	
Total			-2095.9631	(283)
Total Primary energy kWh/year			12050.2611	(286)
Target Primary Energy Rate (TPER)			26.7200	(287)

Full SAP Calculation Printout

Property Reference	House Type I	Issued on Date	05/10/2023
Assessment Reference	Plot 46	Prop Type Ref	
Property			

SAP Rating	82 B	DER	3.82	TER	8.86
Environmental	96 A	% DER < TER			56.88
CO_2 Emissions (t/year)	0.46	DFEE	31.69	TFEE	33.44
Compliance Check	See BREL	% DFEE < TFEE			5.25
% DPER < TPER	12.44	DPER	40.28	TPER	46.00

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
First floor	43.0000 (1c)	x	2.4000 (2c)	=	103.2000 (1c)	-
Second floor	37.0000 (1d)	x	2.4000 (2d)	=	88.8000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	130.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	312.0000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0321	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2321	(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) =	0.1972	(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	0.2515	0.2466	0.2416	0.2170	0.2120	0.1874	0.1874	0.1825	0.1972	0.2120	0.2219	0.2318	(22b)
Effective ac	0.5316	0.5304	0.5292	0.5235	0.5225	0.5176	0.5176	0.5166	0.5195	0.5225	0.5246	0.5269	(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	
Opening Type 1 (Uw = 1.20)			37.7000	1.1450	43.1679			(27)
Heatloss Floor 1			50.0000	0.1200	6.0000	110.0000	5500.0000	(28a)
External Wall 1	96.0000	37.7000	58.3000	0.1900	11.0770	190.0000	11077.0000	(29a)
External Roof 1	50.0000		50.0000	0.1500	7.5000	9.0000	450.0000	(30)
Total net area of external elements Aum(A, m2)			196.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	67.7449			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17027.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 130.9769 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	20.0000	0.0670	1.3400
E6 Intermediate floor within a dwelling	40.0000	0.0020	0.0800
E16 Corner (normal)	14.4000	0.0410	0.5904
E18 Party wall between dwellings	14.4000	0.0400	0.5760
E2 Other lintels (including other steel lintels)	18.1800	0.0240	0.4363
E3 Sill	14.9300	0.0190	0.2837
E4 Jamb	51.9000	0.0140	0.7266
E11 Eaves (insulation at rafter level)	22.0000	0.0110	0.2420

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.2750 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 72.0199 (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	54.7359	54.6094	54.4855	53.9034	53.7945	53.2876	53.2876	53.1937	53.4828	53.7945	54.0148	54.2452	(38)
Heat transfer coeff	126.7558	126.6294	126.5054	125.9234	125.8145	125.3075	125.3075	125.2136	125.5028	125.8145	126.0348	126.2651	(39)

Average = Sum(39)m / 12 = 125.9228

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9750	0.9741	0.9731	0.9686	0.9678	0.9639	0.9639	0.9632	0.9654	0.9678	0.9695	0.9713	(40)
HLP (average)												0.9686	
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 2.8950 (42)
Hot water usage for mixer showers

72.7593	71.6659	70.0725	67.0240	64.7742	62.2653	60.8392	62.4205	64.1538	66.8477	69.9617	72.4805	(42a)

Hot water usage for baths

31.4121	30.9456	30.2886	29.0773	28.1703	27.1646	26.6214	27.2737	27.9840	29.0602	30.2964	31.3059	(42b)

Hot water usage for other uses

44.2776	42.6675	41.0574	39.4473	37.8372	36.2271	36.2271	37.8372	39.4473	41.0574	42.6675	44.2776	(42c)

Average daily hot water use (litres/day) 136.4580 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.4490	145.2790	141.4186	135.5486	130.7817	125.6570	123.6877	127.5314	131.5852	136.9653	142.9256	148.0640	(44)
Energy conte	235.1069	206.8753	217.3551	185.5593	176.0573	154.5099	149.5895	157.9105	162.2577	185.8606	203.6238	231.8325	(45)

Energy content (annual) Total = Sum(45)m = 2266.5384
Distribution loss (46)m = 0.15 x (45)m

35.2660	31.0313	32.6033	27.8339	26.4086	23.1765	22.4384	23.6866	24.3387	27.8791	30.5436	34.7749	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

288.5013	255.1025	270.7495	237.2313	229.4517	206.1819	202.9839	211.3049	213.9297	239.2550	255.2958	285.2269	(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

288.5013	255.1025	270.7495	237.2313	229.4517	206.1819	202.9839	211.3049	213.9297	239.2550	255.2958	285.2269	(64)

Total per year (kWh/year) = Sum(64)m = 2895.2144 (64)
12Total per year (kWh/year) 2895 (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

120.8886	107.3678	114.9861	103.0361	101.2546	92.7122	92.4540	95.2208	95.2883	104.5142	109.0425	119.7998	(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	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	150.1658	166.2550	150.1658	155.1714	150.1658	155.1714	150.1658	150.1658	155.1714	150.1658	155.1714	150.1658	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	297.7205	300.8100	293.0247	276.4510	255.5295	235.8663	222.7301	219.6407	227.4259	243.9997	264.9211	284.5843	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	(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)													
	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	(71)

Water heating gains (Table 5)

	162.4846	159.7735	154.5512	143.1056	136.0949	128.7669	124.2662	127.9849	132.3448	140.4760	151.4479	161.0213 (72)

Total internal gains

	676.7959	693.2633	664.1666	641.1528	608.2151	586.2294	563.5870	564.2163	581.3670	601.0664	637.9653	662.1963 (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	4.9000	10.6334	0.7600	0.7000	0.7700	19.2094 (74)
East	13.7000	19.6403	0.7600	0.7000	0.7700	99.2002 (76)
West	19.1000	19.6403	0.7600	0.7000	0.7700	138.3011 (80)

Solar gains	256.7107	501.3130	827.5143	1216.1009	1502.5567	1544.4579	1467.7263	1251.9038	964.8838	594.9891	319.8334	211.3234 (83)
Total gains	933.5065	1194.5763	1491.6809	1857.2537	2110.7718	2130.6874	2031.3133	1816.1201	1546.2507	1196.0555	957.7987	873.5197 (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	37.3137	37.3509	37.3875	37.5603	37.5928	37.7449	37.7449	37.7732	37.6862	37.5928	37.5271	37.4587	
alpha	3.4876	3.4901	3.4925	3.5040	3.5062	3.5163	3.5163	3.5182	3.5124	3.5062	3.5018	3.4972	
util living area	0.9670	0.9295	0.8500	0.6956	0.5208	0.3687	0.2694	0.3133	0.5254	0.8116	0.9414	0.9731	(86)
Living	19.3082	19.7060	20.2104	20.6764	20.9010	20.9772	20.9943	20.9903	20.9250	20.5284	19.8133	19.2265	
Non living	18.1271	18.6242	19.2399	19.7825	20.0223	20.0975	20.1107	20.1090	20.0542	19.6341	18.7685	18.0263	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	11	
MIT	20.1345	19.7060	20.2104	20.6764	20.9010	20.9772	20.9943	20.9903	20.9250	20.5284	19.8133	19.4994	(87)
Th 2	20.1042	20.1050	20.1058	20.1095	20.1103	20.1135	20.1135	20.1141	20.1123	20.1103	20.1088	20.1073	(88)
util rest of house	0.9615	0.9187	0.8294	0.6617	0.4781	0.3201	0.2160	0.2545	0.4671	0.7782	0.9305	0.9685	(89)
MIT 2	19.3160	18.6242	19.2399	19.7825	20.0223	20.0975	20.1107	20.1090	20.0542	19.6341	18.7685	18.4388	(90)
Living area fraction										fLA = Living area / (4) =		0.1923	(91)
MIT	19.4734	18.8322	19.4266	19.9544	20.1913	20.2666	20.2806	20.2785	20.2217	19.8061	18.9694	18.6428	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4734	18.8322	19.4266	19.9544	20.1913	20.2666	20.2806	20.2785	20.2217	19.8061	18.9694	18.6428	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9570	0.8998	0.8117	0.6555	0.4821	0.3286	0.2261	0.2655	0.4745	0.7654	0.9128	0.9588	(94)
Useful gains	893.3244	1074.8780	1210.7784	1217.4114	1017.5057	700.0666	459.2614	482.1918	733.6805	915.4914	874.2742	837.5176	(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	1923.3179	1764.2305	1635.2812	1392.0088	1068.3319	710.0725	461.2044	485.6348	768.2899	1158.2554	1495.9615	1823.6166	(97)
Space heating kWh	766.3151	463.2448	315.8301	125.7101	37.8147	0.0000	0.0000	0.0000	0.0000	180.6164	447.6149	733.6577	(98a)
Space heating requirement - total per year (kWh/year)												3070.8038	
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	766.3151	463.2448	315.8301	125.7101	37.8147	0.0000	0.0000	0.0000	0.0000	180.6164	447.6149	733.6577	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3070.8038	
Space heating per m2											(98c) / (4) =	23.6216	(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 %) 284.4221 (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	766.3151	463.2448	315.8301	125.7101	37.8147	0.0000	0.0000	0.0000	0.0000	180.6164	447.6149	733.6577	(98)
Space heating efficiency (main heating system 1)	284.4221	284.4221	284.4221	284.4221	284.4221	0.0000	0.0000	0.0000	0.0000	284.4221	284.4221	284.4221	(210)
Space heating fuel (main heating system)	269.4288	162.8723	111.0427	44.1984	13.2953	0.0000	0.0000	0.0000	0.0000	63.5029	157.3770	257.9468	(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												
	288.5013	255.1025	270.7495	237.2313	229.4517	206.1819	202.9839	211.3049	213.9297	239.2550	255.2958	285.2269 (64)
Efficiency of water heater												145.5910 (216)
(217)m	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910 (217)
Fuel for water heating, kWh/month												
	198.1587	175.2185	185.9657	162.9436	157.6002	141.6172	139.4206	145.1359	146.9388	164.3336	175.3513	195.9096 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	40.7081	32.6575	29.4045	21.5430	16.6404	13.5954	15.1799	19.7315	25.6292	33.6269	37.9815	41.8395 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1079.6642 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	145.5910
Water heating fuel used	1988.5937 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	328.5373 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	3396.7952 (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	1079.6642	0.1570	169.4870	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1988.5937	0.1410	280.3039	(264)
Space and water heating			449.7909	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	328.5373	0.1443	47.4181	(268)
Total CO2, kg/year			497.2090	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8200	(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	1079.6642	1.5811	1707.0375	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1988.5937	1.5212	3025.0615	(278)
Space and water heating			4732.0990	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	328.5373	1.5338	503.9215	(282)
Total Primary energy kWh/year			5236.0205	(286)
Dwelling Primary energy Rate (DPER)			40.2800	(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	50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
First floor	43.0000 (1c)	x	2.4000 (2c)	=	103.2000 (1c)	-
Second floor	37.0000 (1d)	x	2.4000 (2d)	=	88.8000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	130.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	312.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1282	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3782	(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) =	0.3215	(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	0.4099	0.4018	0.3938	0.3536	0.3456	0.3054	0.3054	0.2974	0.3215	0.3456	0.3617	0.3777	(22b)
Effective ac	0.5840	0.5807	0.5775	0.5625	0.5597	0.5466	0.5466	0.5442	0.5517	0.5597	0.5654	0.5713	(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 Opening Type (Uw = 1.20)			32.5000	1.1450	37.2137			(27)
Heatloss Floor 1			50.0000	0.1300	6.5000			(28a)
External Wall 1	96.0000	32.5000	63.5000	0.1800	11.4300			(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000			(30)
Total net area of external elements Aum(A, m2)			196.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.6437			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	130.9769	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	20.0000	0.1600	3.2000
E6 Intermediate floor within a dwelling	40.0000	0.0000	0.0000
E16 Corner (normal)	14.4000	0.0900	1.2960
E18 Party wall between dwellings	14.4000	0.0600	0.8640
E2 Other lintels (including other steel lintels)	18.1800	0.0500	0.9090
E3 Sill	14.9300	0.0500	0.7465
E4 Jamb	51.9000	0.0500	2.5950
E11 Eaves (insulation at rafter level)	22.0000	0.0400	0.8800

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.4905	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	71.1342	(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	60.1287	59.7929	59.4637	57.9175	57.6282	56.2815	56.2815	56.0321	56.8002	57.6282	58.2134	58.8253	(38)
Heat transfer coeff	131.2630	130.9271	130.5979	129.0517	128.7624	127.4158	127.4158	127.1664	127.9345	128.7624	129.3477	129.9595	(39)
Average = Sum(39)m / 12 =												129.0503	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0097	1.0071	1.0046	0.9927	0.9905	0.9801	0.9801	0.9782	0.9841	0.9905	0.9950	0.9997	(40)
HLP (average)												0.9927	
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 2.8950 (42)

Hot water usage for mixer showers

72.7593	71.6659	70.0725	67.0240	64.7742	62.2653	60.8392	62.4205	64.1538	66.8477	69.9617	72.4805 (42a)

Hot water usage for baths

31.4121	30.9456	30.2886	29.0773	28.1703	27.1646	26.6214	27.2737	27.9840	29.0602	30.2964	31.3059 (42b)

Hot water usage for other uses

44.2776	42.6675	41.0574	39.4473	37.8372	36.2271	36.2271	37.8372	39.4473	41.0574	42.6675	44.2776 (42c)

Average daily hot water use (litres/day) 136.4580 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.4490	145.2790	141.4186	135.5486	130.7817	125.6570	123.6877	127.5314	131.5852	136.9653	142.9256	148.0640	(44)
Energy conte	235.1069	206.8753	217.3551	185.5593	176.0573	154.5099	149.5895	157.9105	162.2577	185.8606	203.6238	231.8325	(45)
Energy content (annual)										Total = Sum(45)m =		2266.5384	
Distribution loss (46)m = 0.15 x (45)m													
	35.2660	31.0313	32.6033	27.8339	26.4086	23.1765	22.4384	23.6866	24.3387	27.8791	30.5436	34.7749	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	281.7018	248.9610	263.9500	230.6511	222.6523	199.6018	196.1844	204.5054	207.3495	232.4555	248.7156	278.4274	(62)
WWHRS	-33.2625	-29.4176	-30.8045	-25.5073	-23.7719	-20.3418	-19.0672	-20.2760	-21.0464	-24.8114	-28.1083	-32.6465	(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													
	248.4393	219.5434	233.1455	205.1438	198.8804	179.2600	177.1173	184.2294	186.3031	207.6441	220.6074	245.7808	(64)
										Total per year (kWh/year) = Sum(64)m =		2506.0944	(64)
12Total per year (kWh/year)												2506	(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													
	115.4490	102.4546	109.5465	97.7719	95.8150	87.4480	87.0144	89.7812	90.0242	99.0746	103.7784	114.3602	(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	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	150.1658	166.2550	150.1658	155.1714	150.1658	155.1714	150.1658	150.1658	155.1714	150.1658	155.1714	150.1658	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	297.7205	300.8100	293.0247	276.4510	255.5295	235.8663	222.7301	219.6407	227.4259	243.9997	264.9211	284.5843	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	(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)													
	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	(71)
Water heating gains (Table 5)													
	155.1733	152.4622	147.2399	135.7943	128.7836	121.4556	116.9549	120.6736	125.0335	133.1647	144.1366	153.7100	(72)
Total internal gains													
	672.4846	688.9520	659.8553	636.8415	603.9038	578.9181	556.2757	556.9050	574.0557	596.7551	633.6540	657.8850	(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	4.2200	10.6334	0.6300	0.7000	0.7700	13.7137	(74)
East	11.8100	19.6403	0.6300	0.7000	0.7700	70.8874	(76)
West	16.4700	19.6403	0.6300	0.7000	0.7700	98.8582	(80)

Solar gains	183.4594	358.2661	591.3862	869.0842	1073.7903	1103.7300	1048.8966	894.6675	689.5560	425.2121	228.5705	151.0230	(83)
Total gains	855.9439	1047.2181	1251.2415	1505.9257	1677.6941	1682.6482	1605.1723	1451.5725	1263.6116	1021.9672	862.2245	808.9080	(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	36.0324	36.1248	36.2159	36.6498	36.7322	37.1204	37.1204	37.1932	36.9699	36.7322	36.5660	36.3938	
alpha	3.4022	3.4083	3.4144	3.4433	3.4488	3.4747	3.4747	3.4795	3.4647	3.4488	3.4377	3.4263	
util living area													
	0.9747	0.9514	0.9018	0.7888	0.6316	0.4637	0.3433	0.3926	0.6225	0.8667	0.9567	0.9788	(86)
MIT	19.1280	19.4662	19.9432	20.4821	20.8087	20.9509	20.9868	20.9791	20.8664	20.3712	19.6524	19.0755	(87)
Th 2	20.0752	20.0774	20.0795	20.0894	20.0913	20.0999	20.0999	20.1015	20.0966	20.0913	20.0875	20.0836	(88)
util rest of house													
	0.9703	0.9433	0.8861	0.7584	0.5855	0.4047	0.2755	0.3199	0.5597	0.8389	0.9482	0.9751	(89)
MIT 2	17.8812	18.3082	18.9016	19.5525	19.9165	20.0644	20.0932	20.0902	19.9897	19.4422	18.5550	17.8201	(90)
Living area fraction										fLA = Living area / (4) =		0.1923	(91)
MIT	18.1210	18.5309	19.1019	19.7313	20.0881	20.2349	20.2650	20.2611	20.1583	19.6208	18.7660	18.0615	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1210	18.5309	19.1019	19.7313	20.0881	20.2349	20.2650	20.2611	20.1583	19.6208	18.7660	18.0615	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9574	0.9258	0.8660	0.7452	0.5853	0.4137	0.2881	0.3331	0.5642	0.8220	0.9317	0.9635	(94)
Useful gains	819.5072	969.4764	1083.5751	1122.2823	982.0024	696.1493	462.4279	483.4676	712.9570	840.0972	803.3489	779.3699	(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													
	1814.1833	1784.6484	1645.7812	1397.7948	1080.0731	717.9756	466.9833	491.0040	775.0638	1161.5438	1508.9703	1801.4381	(97)
Space heating kWh													
	740.0390	547.7955	418.2814	198.3690	72.9645	0.0000	0.0000	0.0000	0.0000	239.1563	508.0474	760.4187	(98a)
Space heating requirement - total per year (kWh/year)												3485.0719	
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													
	740.0390	547.7955	418.2814	198.3690	72.9645	0.0000	0.0000	0.0000	0.0000	239.1563	508.0474	760.4187	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3485.0719	
Space heating per m2											(98c) / (4) =	26.8082	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	740.0390	547.7955	418.2814	198.3690	72.9645	0.0000	0.0000	0.0000	0.0000	239.1563	508.0474	760.4187	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	801.7757	593.4946	453.1759	214.9176	79.0515	0.0000	0.0000	0.0000	0.0000	259.1076	550.4306	823.8556	(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													
	248.4393	219.5434	233.1455	205.1438	198.8804	179.2600	177.1173	184.2294	186.3031	207.6441	220.6074	245.7808	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3523	86.0242	85.3547	83.9845	82.0315	79.8000	79.8000	79.8000	79.8000	84.3775	85.8680	86.4192	(217)
Fuel for water heating, kWh/month													
	287.7045	255.2113	273.1490	244.2638	242.4438	224.6366	221.9514	230.8639	233.4626	246.0895	256.9146	284.4052	(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	31.2015	25.0310	22.5376	16.5120	12.7544	10.4204	11.6350	15.1236	19.6440	25.7740	29.1117	32.0687	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-47.2328	-66.8287	-96.3826	-108.7056	-117.4380	-109.6108	-108.1654	-101.9512	-91.1065	-76.4703	-51.9757	-40.7999	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-25.9771	-54.7235	-108.9369	-163.8959	-217.0292	-218.2558	-215.7790	-182.6378	-133.7227	-78.4635	-34.7421	-20.5441	(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												3775.8092	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater		79.8000
Water heating fuel used		3001.0963 (219)
Space cooling fuel		0.0000 (221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year		86.0000 (231)
Electricity for lighting (calculated in Appendix L)		251.8139 (232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation		-2471.3753 (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		4643.3441 (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	3775.8092	0.2100	792.9199	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3001.0963	0.2100	630.2302	(264)
Space and water heating			1423.1502	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	251.8139	0.1443	36.3445	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1016.6676	0.1345	-136.7767	
PV Unit electricity exported	-1454.7077	0.1258	-183.0540	
Total			-319.8306	(269)
Total CO2, kg/year			1151.5933	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.8600	(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	3775.8092	1.1300	4266.6644	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3001.0963	1.1300	3391.2388	(278)
Space and water heating			7657.9032	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	251.8139	1.5338	386.2406	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1016.6676	1.4972	-1522.1682	
PV Unit electricity exported	-1454.7077	0.4619	-671.9285	
Total			-2194.0967	(283)
Total Primary energy kWh/year			5980.1479	(286)
Target Primary Energy Rate (TPER)			46.0000	(287)

Full SAP Calculation Printout

Property Reference	House Type I	Issued on Date	05/10/2023
Assessment Reference	Plot 47	Prop Type Ref	
Property			

SAP Rating	82 B	DER	3.74	TER	8.58
Environmental	96 A	% DER < TER			56.41
CO_2 Emissions (t/year)	0.45	DFEE	30.29	TFEE	32.23
Compliance Check	See BREL	% DFEE < TFEE			6.04
% DPER < TPER	11.41	DPER	39.42	TPER	44.50

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
First floor	43.0000 (1c)	x	2.4000 (2c)	=	103.2000 (1c)	-
Second floor	37.0000 (1d)	x	2.4000 (2d)	=	88.8000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	130.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	312.0000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0321	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2321	(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) =	0.1972	(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	0.2515	0.2466	0.2416	0.2170	0.2120	0.1874	0.1874	0.1825	0.1972	0.2120	0.2219	0.2318	(22b)
Effective ac	0.5316	0.5304	0.5292	0.5235	0.5225	0.5176	0.5176	0.5166	0.5195	0.5225	0.5246	0.5269	(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	
Opening Type 1 (Uw = 1.20)			37.7000	1.1450	43.1679			(27)
Heatloss Floor 1			50.0000	0.1200	6.0000	110.0000	5500.0000	(28a)
External Wall 1	96.0000	37.7000	58.3000	0.1900	11.0770	190.0000	11077.0000	(29a)
External Roof 1	50.0000		50.0000	0.1500	7.5000	9.0000	450.0000	(30)
Total net area of external elements Aum(A, m2)			196.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	67.7449			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17027.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 130.9769 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	20.0000	0.0670	1.3400
E6 Intermediate floor within a dwelling	40.0000	0.0020	0.0800
E16 Corner (normal)	14.4000	0.0410	0.5904
E18 Party wall between dwellings	14.4000	0.0400	0.5760
E2 Other lintels (including other steel lintels)	18.1800	0.0240	0.4363
E3 Sill	14.9300	0.0190	0.2837
E4 Jamb	51.9000	0.0140	0.7266
E11 Eaves (insulation at rafter level)	22.0000	0.0110	0.2420

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.2750 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 72.0199 (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	54.7359	54.6094	54.4855	53.9034	53.7945	53.2876	53.2876	53.1937	53.4828	53.7945	54.0148	54.2452	(38)
Heat transfer coeff	126.7558	126.6294	126.5054	125.9234	125.8145	125.3075	125.3075	125.2136	125.5028	125.8145	126.0348	126.2651	(39)

Average = Sum(39)m / 12 = 125.9228

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9750	0.9741	0.9731	0.9686	0.9678	0.9639	0.9639	0.9632	0.9654	0.9678	0.9695	0.9713	(40)
HLP (average)												0.9686	
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 2.8950 (42)
Hot water usage for mixer showers

72.7593	71.6659	70.0725	67.0240	64.7742	62.2653	60.8392	62.4205	64.1538	66.8477	69.9617	72.4805	(42a)

Hot water usage for baths

31.4121	30.9456	30.2886	29.0773	28.1703	27.1646	26.6214	27.2737	27.9840	29.0602	30.2964	31.3059	(42b)

Hot water usage for other uses

44.2776	42.6675	41.0574	39.4473	37.8372	36.2271	36.2271	37.8372	39.4473	41.0574	42.6675	44.2776	(42c)

Average daily hot water use (litres/day) 136.4580 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.4490	145.2790	141.4186	135.5486	130.7817	125.6570	123.6877	127.5314	131.5852	136.9653	142.9256	148.0640	(44)
Energy conte	235.1069	206.8753	217.3551	185.5593	176.0573	154.5099	149.5895	157.9105	162.2577	185.8606	203.6238	231.8325	(45)

Energy content (annual) Total = Sum(45)m = 2266.5384
Distribution loss (46)m = 0.15 x (45)m

35.2660	31.0313	32.6033	27.8339	26.4086	23.1765	22.4384	23.6866	24.3387	27.8791	30.5436	34.7749	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

288.5013	255.1025	270.7495	237.2313	229.4517	206.1819	202.9839	211.3049	213.9297	239.2550	255.2958	285.2269	(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

288.5013	255.1025	270.7495	237.2313	229.4517	206.1819	202.9839	211.3049	213.9297	239.2550	255.2958	285.2269	(64)

Total per year (kWh/year) = Sum(64)m = 2895.2144 (64)
12Total per year (kWh/year) 2895 (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

120.8886	107.3678	114.9861	103.0361	101.2546	92.7122	92.4540	95.2208	95.2883	104.5142	109.0425	119.7998	(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	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	150.1658	166.2550	150.1658	155.1714	150.1658	155.1714	150.1658	150.1658	155.1714	150.1658	155.1714	150.1658	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	297.7205	300.8100	293.0247	276.4510	255.5295	235.8663	222.7301	219.6407	227.4259	243.9997	264.9211	284.5843	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	(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)													
	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	(71)

Water heating gains (Table 5)

	162.4846	159.7735	154.5512	143.1056	136.0949	128.7669	124.2662	127.9849	132.3448	140.4760	151.4479	161.0213 (72)

Total internal gains

	676.7959	693.2633	664.1666	641.1528	608.2151	586.2294	563.5870	564.2163	581.3670	601.0664	637.9653	662.1963 (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
East	13.7000	19.6403	0.7600	0.7000	0.7700	99.2002 (76)
South	4.9000	46.7521	0.7600	0.7000	0.7700	84.4582 (78)
West	19.1000	19.6403	0.7600	0.7000	0.7700	138.3011 (80)

Solar gains	321.9595	602.9237	941.3310	1315.0435	1575.0978	1599.6693	1527.9470	1334.3678	1073.9412	700.4825	396.2480	268.2892 (83)
Total gains	998.7554	1296.1870	1605.4976	1956.1963	2183.3129	2185.8987	2091.5340	1898.5841	1655.3081	1301.5489	1034.2132	930.4854 (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	37.3137	37.3509	37.3875	37.5603	37.5928	37.7449	37.7449	37.7732	37.6862	37.5928	37.5271	37.4587	
alpha	3.4876	3.4901	3.4925	3.5040	3.5062	3.5163	3.5163	3.5182	3.5124	3.5062	3.5018	3.4972	
util living area	0.9602	0.9137	0.8261	0.6727	0.5062	0.3600	0.2618	0.3002	0.4961	0.7801	0.9287	0.9678	(86)
Living	19.3866	19.8091	20.2917	20.7099	20.9094	20.9789	20.9948	20.9915	20.9373	20.5907	19.8953	19.2969	
Non living	18.2254	18.7504	19.3347	19.8181	20.0301	20.0987	20.1109	20.1097	20.0642	19.7020	18.8688	18.1149	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	11	
MIT	20.1746	19.8091	20.2917	20.7099	20.9094	20.9789	20.9948	20.9915	20.9373	20.5907	19.8953	19.5590	(87)
Th 2	20.1042	20.1050	20.1058	20.1095	20.1103	20.1135	20.1135	20.1141	20.1123	20.1103	20.1088	20.1073	(88)
util rest of house	0.9537	0.9011	0.8036	0.6384	0.4642	0.3123	0.2098	0.2436	0.4397	0.7443	0.9159	0.9624	(89)
MIT 2	19.3552	18.7504	19.3347	19.8181	20.0301	20.0987	20.1109	20.1097	20.0642	19.7020	18.8688	18.5098	(90)
Living area fraction									fLA = Living area / (4) =			0.1923	(91)
MIT	19.5128	18.9540	19.5188	19.9896	20.1992	20.2679	20.2809	20.2792	20.2321	19.8729	19.0662	18.7116	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5128	18.9540	19.5188	19.9896	20.1992	20.2679	20.2809	20.2792	20.2321	19.8729	19.0662	18.7116	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9487	0.8816	0.7872	0.6336	0.4685	0.3207	0.2197	0.2543	0.4475	0.7337	0.8974	0.9517	(94)
Useful gains	947.5413	1142.7464	1263.8596	1239.3809	1022.7951	700.9736	459.4743	482.7410	740.7392	954.9909	928.0576	885.5325	(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	1928.3053	1779.6512	1646.9448	1396.4398	1069.3214	710.2356	461.2428	485.7339	769.6013	1166.6641	1508.1553	1832.3073	(97)
Space heating kWh	729.6884	428.0000	285.0154	113.0824	34.6156	0.0000	0.0000	0.0000	0.0000	157.4849	417.6703	704.4005	(98a)
Space heating requirement - total per year (kWh/year)												2869.9575	
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	729.6884	428.0000	285.0154	113.0824	34.6156	0.0000	0.0000	0.0000	0.0000	157.4849	417.6703	704.4005	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2869.9575	
Space heating per m2											(98c) / (4) =	22.0766	(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 %) 284.4221 (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	729.6884	428.0000	285.0154	113.0824	34.6156	0.0000	0.0000	0.0000	0.0000	157.4849	417.6703	704.4005	(98)
Space heating efficiency (main heating system 1)	284.4221	284.4221	284.4221	284.4221	284.4221	0.0000	0.0000	0.0000	0.0000	284.4221	284.4221	284.4221	(210)
Space heating fuel (main heating system)	256.5512	150.4806	100.2086	39.7587	12.1705	0.0000	0.0000	0.0000	0.0000	55.3701	146.8487	247.6602	(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												
	288.5013	255.1025	270.7495	237.2313	229.4517	206.1819	202.9839	211.3049	213.9297	239.2550	255.2958	285.2269 (64)
Efficiency of water heater												145.5910 (216)
(217)m	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910	145.5910 (217)
Fuel for water heating, kWh/month												
	198.1587	175.2185	185.9657	162.9436	157.6002	141.6172	139.4206	145.1359	146.9388	164.3336	175.3513	195.9096 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	40.7081	32.6575	29.4045	21.5430	16.6404	13.5954	15.1799	19.7315	25.6292	33.6269	37.9815	41.8395 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1009.0486 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	145.5910
Water heating fuel used	1988.5937 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	328.5373 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	3326.1796 (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	1009.0486	0.1572	158.5918	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1988.5937	0.1410	280.3039	(264)
Space and water heating			438.8957	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	328.5373	0.1443	47.4181	(268)
Total CO2, kg/year			486.3138	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7400	(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	1009.0486	1.5818	1596.0799	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1988.5937	1.5212	3025.0615	(278)
Space and water heating			4621.1414	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	328.5373	1.5338	503.9215	(282)
Total Primary energy kWh/year			5125.0629	(286)
Dwelling Primary energy Rate (DPER)			39.4200	(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	50.0000 (1b)	x	2.4000 (2b)	=	120.0000 (1b)	-
First floor	43.0000 (1c)	x	2.4000 (2c)	=	103.2000 (1c)	-
Second floor	37.0000 (1d)	x	2.4000 (2d)	=	88.8000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	130.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	312.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1282	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3782	(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) =	0.3215	(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	0.4099	0.4018	0.3938	0.3536	0.3456	0.3054	0.3054	0.2974	0.3215	0.3456	0.3617	0.3777	(22b)
Effective ac	0.5840	0.5807	0.5775	0.5625	0.5597	0.5466	0.5466	0.5442	0.5517	0.5597	0.5654	0.5713	(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 Opening Type (Uw = 1.20)			32.5000	1.1450	37.2137			(27)
Heatloss Floor 1			50.0000	0.1300	6.5000			(28a)
External Wall 1	96.0000	32.5000	63.5000	0.1800	11.4300			(29a)
External Roof 1	50.0000		50.0000	0.1100	5.5000			(30)
Total net area of external elements Aum(A, m2)			196.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	60.6437			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	130.9769	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	20.0000	0.1600	3.2000
E6 Intermediate floor within a dwelling	40.0000	0.0000	0.0000
E16 Corner (normal)	14.4000	0.0900	1.2960
E18 Party wall between dwellings	14.4000	0.0600	0.8640
E2 Other lintels (including other steel lintels)	18.1800	0.0500	0.9090
E3 Sill	14.9300	0.0500	0.7465
E4 Jamb	51.9000	0.0500	2.5950
E11 Eaves (insulation at rafter level)	22.0000	0.0400	0.8800

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.4905	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	71.1342	(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	60.1287	59.7929	59.4637	57.9175	57.6282	56.2815	56.2815	56.0321	56.8002	57.6282	58.2134	58.8253	(38)
Heat transfer coeff	131.2630	130.9271	130.5979	129.0517	128.7624	127.4158	127.4158	127.1664	127.9345	128.7624	129.3477	129.9595	(39)
Average = Sum(39)m / 12 =												129.0503	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0097	1.0071	1.0046	0.9927	0.9905	0.9801	0.9801	0.9782	0.9841	0.9905	0.9950	0.9997	(40)
HLP (average)												0.9927	
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												2.8950	(42)
Hot water usage for mixer showers													
	72.7593	71.6659	70.0725	67.0240	64.7742	62.2653	60.8392	62.4205	64.1538	66.8477	69.9617	72.4805	(42a)
Hot water usage for baths													
	31.4121	30.9456	30.2886	29.0773	28.1703	27.1646	26.6214	27.2737	27.9840	29.0602	30.2964	31.3059	(42b)
Hot water usage for other uses													
	44.2776	42.6675	41.0574	39.4473	37.8372	36.2271	36.2271	37.8372	39.4473	41.0574	42.6675	44.2776	(42c)
Average daily hot water use (litres/day)												136.4580	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.4490	145.2790	141.4186	135.5486	130.7817	125.6570	123.6877	127.5314	131.5852	136.9653	142.9256	148.0640	(44)
Energy conte	235.1069	206.8753	217.3551	185.5593	176.0573	154.5099	149.5895	157.9105	162.2577	185.8606	203.6238	231.8325	(45)
Energy content (annual)											Total = Sum(45)m =	2266.5384	
Distribution loss (46)m = 0.15 x (45)m													
	35.2660	31.0313	32.6033	27.8339	26.4086	23.1765	22.4384	23.6866	24.3387	27.8791	30.5436	34.7749	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	281.7018	248.9610	263.9500	230.6511	222.6523	199.6018	196.1844	204.5054	207.3495	232.4555	248.7156	278.4274	(62)
WWHRS	-33.2625	-29.4176	-30.8045	-25.5073	-23.7719	-20.3418	-19.0672	-20.2760	-21.0464	-24.8114	-28.1083	-32.6465	(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													
	248.4393	219.5434	233.1455	205.1438	198.8804	179.2600	177.1173	184.2294	186.3031	207.6441	220.6074	245.7808	(64)
										Total per year (kWh/year) = Sum(64)m =		2506.0944	(64)
12Total per year (kWh/year)												2506	(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													
	115.4490	102.4546	109.5465	97.7719	95.8150	87.4480	87.0144	89.7812	90.0242	99.0746	103.7784	114.3602	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	144.7495	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	150.1658	166.2550	150.1658	155.1714	150.1658	155.1714	150.1658	150.1658	155.1714	150.1658	155.1714	150.1658	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	297.7205	300.8100	293.0247	276.4510	255.5295	235.8663	222.7301	219.6407	227.4259	243.9997	264.9211	284.5843	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	37.4750	(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)													
	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	-115.7996	(71)
Water heating gains (Table 5)													
	155.1733	152.4622	147.2399	135.7943	128.7836	121.4556	116.9549	120.6736	125.0335	133.1647	144.1366	153.7100	(72)
Total internal gains													
	672.4846	688.9520	659.8553	636.8415	603.9038	578.9181	556.2757	556.9050	574.0557	596.7551	633.6540	657.8850	(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	
East	11.8100	19.6403	0.6300	0.7000	0.7700	70.8874	(76)
South	4.2200	46.7521	0.6300	0.7000	0.7700	60.2955	(78)
West	16.4700	19.6403	0.6300	0.7000	0.7700	98.8582	(80)

Solar gains	230.0411	430.8069	672.6410	939.7202	1125.5781	1143.1459	1091.8887	953.5394	767.4131	500.5248	283.1236	191.6914	(83)
Total gains	902.5257	1119.7590	1332.4963	1576.5618	1729.4819	1722.0641	1648.1644	1510.4444	1341.4688	1097.2800	916.7776	849.5764	(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	36.0324	36.1248	36.2159	36.6498	36.7322	37.1204	37.1204	37.1932	36.9699	36.7322	36.5660	36.3938	
alpha	3.4022	3.4083	3.4144	3.4433	3.4488	3.4747	3.4747	3.4795	3.4647	3.4488	3.4377	3.4263	
util living area													
	0.9707	0.9422	0.8867	0.7712	0.6179	0.4543	0.3348	0.3784	0.5956	0.8454	0.9491	0.9756	(86)
MIT	19.1855	19.5472	20.0167	20.5209	20.8214	20.9539	20.9878	20.9813	20.8836	20.4293	19.7150	19.1268	(87)
Th 2	20.0752	20.0774	20.0795	20.0894	20.0913	20.0999	20.0999	20.1015	20.0966	20.0913	20.0875	20.0836	(88)
util rest of house													
	0.9657	0.9328	0.8693	0.7398	0.5719	0.3961	0.2685	0.3079	0.5334	0.8150	0.9392	0.9713	(89)
MIT 2	17.9537	18.4085	18.9896	19.5955	19.9288	20.0667	20.0937	20.0915	20.0045	19.5079	18.6323	17.8849	(90)
Living area fraction										fLA = Living area / (4) =		0.1923	(91)
MIT	18.1906	18.6275	19.1871	19.7735	20.1004	20.2373	20.2657	20.2626	20.1736	19.6851	18.8405	18.1237	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1906	18.6275	19.1871	19.7735	20.1004	20.2373	20.2657	20.2626	20.1736	19.6851	18.8405	18.1237	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9517	0.9142	0.8494	0.7279	0.5724	0.4052	0.2808	0.3208	0.5390	0.7994	0.9218	0.9588	(94)
Useful gains	858.8907	1023.6783	1131.8274	1147.5282	990.0082	697.8130	462.8614	484.4973	723.0027	877.1191	845.0464	814.5494	(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													
	1823.3211	1797.2997	1656.9119	1403.2450	1081.6607	718.2835	467.0626	491.1925	777.0194	1169.8195	1518.6077	1809.5172	(97)
Space heating kWh													
	717.5362	519.8735	390.6628	184.1161	68.1894	0.0000	0.0000	0.0000	0.0000	217.7691	484.9642	740.2561	(98a)
Space heating requirement - total per year (kWh/year)												3323.3674	
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													
	717.5362	519.8735	390.6628	184.1161	68.1894	0.0000	0.0000	0.0000	0.0000	217.7691	484.9642	740.2561	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3323.3674	
Space heating per m2										(98c) / (4) =		25.5644	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	717.5362	519.8735	390.6628	184.1161	68.1894	0.0000	0.0000	0.0000	0.0000	217.7691	484.9642	740.2561	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	777.3957	563.2433	423.2534	199.4757	73.8780	0.0000	0.0000	0.0000	0.0000	235.9362	525.4216	802.0109	(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													
	248.4393	219.5434	233.1455	205.1438	198.8804	179.2600	177.1173	184.2294	186.3031	207.6441	220.6074	245.7808	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.2968	85.9227	85.2083	83.8181	81.9199	79.8000	79.8000	79.8000	79.8000	84.1667	85.7753	86.3719	(217)
Fuel for water heating, kWh/month													
	287.8892	255.5125	273.6182	244.7488	242.7742	224.6366	221.9514	230.8639	233.4626	246.7057	257.1921	284.5611	(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	31.2015	25.0310	22.5376	16.5120	12.7544	10.4204	11.6350	15.1236	19.6440	25.7740	29.1117	32.0687	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-47.2328	-66.8287	-96.3826	-108.7056	-117.4380	-109.6108	-108.1654	-101.9512	-91.1065	-76.4703	-51.9757	-40.7999	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-25.9771	-54.7235	-108.9369	-163.8959	-217.0292	-218.2558	-215.7790	-182.6378	-133.7227	-78.4635	-34.7421	-20.5441	(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												3600.6148	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	79.8000
Water heating fuel used	3003.9165 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	251.8139 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2471.3753 (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	4470.9700 (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	3600.6148	0.2100	756.1291	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3003.9165	0.2100	630.8225	(264)
Space and water heating			1386.9516	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	251.8139	0.1443	36.3445	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1016.6676	0.1345	-136.7767	
PV Unit electricity exported	-1454.7077	0.1258	-183.0540	
Total			-319.8306	(269)
Total CO2, kg/year			1115.3948	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.5800	(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	3600.6148	1.1300	4068.6947	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3003.9165	1.1300	3394.4257	(278)
Space and water heating			7463.1204	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	251.8139	1.5338	386.2406	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1016.6676	1.4972	-1522.1682	
PV Unit electricity exported	-1454.7077	0.4619	-671.9285	
Total			-2194.0967	(283)
Total Primary energy kWh/year			5785.3651	(286)
Target Primary Energy Rate (TPER)			44.5000	(287)

Full SAP Calculation Printout

Property Reference	House Type Q	Issued on Date	05/10/2023
Assessment Reference	Plot 48	Prop Type Ref	
Property			

SAP Rating	83 B	DER	3.29	TER	9.33
Environmental	97 A	% DER < TER			64.74
CO_2 Emissions (t/year)	0.52	DFEE	36.12	TFEE	40.54
Compliance Check	See BREL	% DFEE < TFEE			10.92
% DPER < TPER	29.72	DPER	34.31	TPER	48.81

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	72.0000 (1b)	x	2.4000 (2b)	=	172.8000 (1b)	-
First floor	64.0000 (1c)	x	2.4000 (2c)	=	153.6000 (1c)	-
Second floor	40.0000 (1d)	x	2.4000 (2d)	=	96.0000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	176.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	422.4000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0237	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2237	(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) =	0.1901	(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	0.2424	0.2377	0.2329	0.2091	0.2044	0.1806	0.1806	0.1759	0.1901	0.2044	0.2139	0.2234	(22b)
Effective ac	0.5294	0.5282	0.5271	0.5219	0.5209	0.5163	0.5163	0.5155	0.5181	0.5209	0.5229	0.5250	(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	
Opening Type 1 (Uw = 1.20)			45.8000	1.1450	52.4427			(27)
Heatloss Floor 1			72.0000	0.1200	8.6400	110.0000	7920.0000	(28a)
External Wall 1	274.0000	45.8000	228.2000	0.1900	43.3580	190.0000	43358.0000	(29a)
External Roof 1	64.0000		64.0000	0.1500	9.6000	9.0000	576.0000	(30)
External Roof 2	8.0000		8.0000	0.1500	1.2000	9.0000	72.0000	(30)
Total net area of external elements Aum(A, m2)			418.0000					(31)

Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 115.2407 (33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 51926.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 295.0341 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	46.0000	0.0670	3.0820
E6 Intermediate floor within a dwelling	66.0000	0.0020	0.1320
E16 Corner (normal)	28.8000	0.0410	1.1808
E2 Other lintels (including other steel lintels)	25.0000	0.0240	0.6000
E3 Sill	20.0000	0.0190	0.3800
E4 Jamb	60.0000	0.0140	0.8400
E10 Eaves (insulation at ceiling level)	20.0000	0.0460	0.9200
E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5308 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 122.7715 (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	73.7914	73.6324	73.4765	72.7443	72.6074	71.9697	71.9697	71.8516	72.2153	72.6074	72.8845	73.1742	(38)
Heat transfer coeff	196.5630	196.4039	196.2481	195.5159	195.3789	194.7412	194.7412	194.6231	194.9868	195.3789	195.6560	195.9457	(39)

Average = Sum(39)m / 12 = 195.5152

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1168	1.1159	1.1150	1.1109	1.1101	1.1065	1.1065	1.1058	1.1079	1.1101	1.1117	1.1133	(40)
HLP (average)												1.1109	
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 2.9705 (42)
Hot water usage for mixer showers

74.0262	72.9137	71.2926	68.1909	65.9020	63.3494	61.8985	63.5073	65.2709	68.0116	71.1799	73.7425	(42a)

Hot water usage for baths

31.9569	31.4823	30.8139	29.5816	28.6589	27.6357	27.0831	27.7467	28.4694	29.5642	30.8219	31.8489	(42b)

Hot water usage for other uses

45.0514	43.4131	41.7749	40.1367	38.4984	36.8602	36.8602	38.4984	40.1367	41.7749	43.4131	45.0514	(42c)

Average daily hot water use (litres/day) 138.8345 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.0344	147.8091	143.8815	137.9093	133.0594	127.8453	125.8418	129.7525	133.8769	139.3507	145.4149	150.6428	(44)
Energy conte	239.2016	210.4782	221.1404	188.7909	179.1235	157.2008	152.1947	160.6607	165.0836	189.0976	207.1701	235.8702	(45)

Energy content (annual) Total = Sum(45)m = 2306.0123
Distribution loss (46)m = 0.15 x (45)m

35.8802	31.5717	33.1711	28.3186	26.8685	23.5801	22.8292	24.0991	24.7625	28.3646	31.0755	35.3805	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

292.5960	258.7054	274.5348	240.4629	232.5179	208.8728	205.5891	214.0551	216.7556	242.4920	258.8421	289.2646	(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

292.5960	258.7054	274.5348	240.4629	232.5179	208.8728	205.5891	214.0551	216.7556	242.4920	258.8421	289.2646	(64)

Total per year (kWh/year) = Sum(64)m = 2934.6883 (64)
12Total per year (kWh/year) 2935 (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

122.2501	108.5658	116.2447	104.1106	102.2741	93.6069	93.3203	96.1352	96.2279	105.5905	110.2217	121.1423	(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	148.5273	148.5273	148.5273	148.5273	148.5273	148.5273	148.5273	148.5273	148.5273	148.5273	148.5273	148.5273	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	175.3346	194.1204	175.3346	181.1790	175.3346	181.1790	175.3346	175.3346	181.1790	175.3346	181.1790	175.3346	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.6204	351.2276	342.1375	322.7859	298.3579	275.3990	260.0611	256.4539	265.5439	284.8956	309.3236	332.2824	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8527	37.8527	37.8527	37.8527	37.8527	37.8527	37.8527	37.8527	37.8527	37.8527	37.8527	37.8527	(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)													

	-118.8219	-118.8219	-118.8219	-118.8219	-118.8219	-118.8219	-118.8219	-118.8219	-118.8219	-118.8219	-118.8219	(71)
Water heating gains (Table 5)												
	164.3146	161.5562	156.2429	144.5980	137.4652	130.0095	125.4305	129.2140	133.6499	141.9227	153.0857	162.8257 (72)
Total internal gains												
	754.8277	774.4624	741.2732	716.1211	678.7158	654.1458	628.3843	628.5606	647.9310	669.7110	711.1465	738.0009 (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	9.6000	10.6334	0.7600	0.7000	0.7700	37.6347	(74)
East	12.8000	19.6403	0.7600	0.7000	0.7700	92.6834	(76)
South	18.9000	46.7521	0.7600	0.7000	0.7700	325.7673	(78)
West	4.5000	19.6403	0.7600	0.7000	0.7700	32.5840	(80)

Solar gains	488.6694	850.4944	1205.3881	1552.9867	1786.1755	1791.7811	1719.9089	1544.4441	1326.2350	951.8401	588.7663	415.8809 (83)
Total gains	1243.4971	1624.9567	1946.6613	2269.1079	2464.8913	2445.9269	2348.2932	2173.0047	1974.1661	1621.5511	1299.9128	1153.8818 (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	73.3805	73.4399	73.4983	73.7735	73.8252	74.0670	74.0670	74.1119	73.9737	73.8252	73.7206	73.6116	
alpha	5.8920	5.8960	5.8999	5.9182	5.9217	5.9378	5.9378	5.9408	5.9316	5.9217	5.9147	5.9074	
util living area													
	0.9980	0.9903	0.9637	0.8727	0.7009	0.5050	0.3643	0.4107	0.6575	0.9328	0.9933	0.9987	(86)
Living	19.9057	20.1676	20.4802	20.7931	20.9521	20.9940	20.9993	20.9985	20.9746	20.7213	20.2338	19.8526	
Non living	18.7192	19.0524	19.4410	19.8040	19.9589	19.9928	19.9954	19.9957	19.9807	19.7370	19.1412	18.6534	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	0	0	0	0	0	0	0	0	0	0	2	
16 / 9	0	28	31	0	0	0	0	0	0	0	13	29	
MIT	21.0000	20.5285	20.7056	20.7931	20.9521	20.9940	20.9993	20.9985	20.9746	20.7213	20.3778	20.3921	(87)
Th 2	19.9871	19.9878	19.9886	19.9920	19.9926	19.9955	19.9955	19.9961	19.9944	19.9926	19.9913	19.9900	(88)
util rest of house													
	0.9972	0.9867	0.9510	0.8354	0.6374	0.4280	0.2815	0.3218	0.5721	0.9028	0.9903	0.9981	(89)
MIT 2	19.9871	19.5750	19.7469	19.8040	19.9589	19.9928	19.9954	19.9957	19.9807	19.7370	19.3470	19.4381	(90)
Living area fraction											fLA = Living area / (4) =	0.1534	(91)
MIT	20.1425	19.7212	19.8940	19.9557	20.1112	20.1464	20.1494	20.1495	20.1332	19.8880	19.5051	19.5844	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1425	19.7212	19.8940	19.9557	20.1112	20.1464	20.1494	20.1495	20.1332	19.8880	19.5051	19.5844	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9973	0.9855	0.9495	0.8339	0.6453	0.4397	0.2942	0.3355	0.5844	0.8990	0.9883	0.9979	(94)
Useful gains	1240.1473	1601.4557	1848.4312	1892.1791	1590.5277	1075.3875	690.8667	729.0058	1153.7126	1457.7447	1284.6826	1151.4303	(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													
	3114.0478	2910.9496	2628.5381	2161.5684	1643.3798	1080.1097	691.2090	729.7478	1176.3910	1814.6802	2427.1389	3014.5161	(97)
Space heating kWh													
	1394.1820	879.9799	580.3995	193.9603	39.3219	0.0000	0.0000	0.0000	0.0000	265.5601	822.5685	1386.1359	(98a)
Space heating requirement - total per year (kWh/year)												5562.1081	
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													
	1394.1820	879.9799	580.3995	193.9603	39.3219	0.0000	0.0000	0.0000	0.0000	265.5601	822.5685	1386.1359	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5562.1081	
Space heating per m2											(98c) / (4) =	31.6029	(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 %)													316.8960 (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													
	1394.1820	879.9799	580.3995	193.9603	39.3219	0.0000	0.0000	0.0000	0.0000	265.5601	822.5685	1386.1359	(98)
Space heating efficiency (main heating system 1)													
	316.8960	316.8960	316.8960	316.8960	316.8960	0.0000	0.0000	0.0000	0.0000	316.8960	316.8960	316.8960	(210)
Space heating fuel (main heating system)													
	439.9495	277.6873	183.1514	61.2063	12.4085	0.0000	0.0000	0.0000	0.0000	83.8004	259.5705	437.4104	(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												
	292.5960	258.7054	274.5348	240.4629	232.5179	208.8728	205.5891	214.0551	216.7556	242.4920	258.8421	289.2646 (64)
Efficiency of water heater												167.5926 (216)
(217)m	167.5926	167.5926	167.5926	167.5926	167.5926	167.5926	167.5926	167.5926	167.5926	167.5926	167.5926	167.5926 (217)
Fuel for water heating, kWh/month												
	174.5876	154.3656	163.8108	143.4806	138.7399	124.6312	122.6719	127.7234	129.3348	144.6913	154.4472	172.5998 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	48.1103	38.5959	34.7513	25.4603	19.6663	16.0675	17.9402	23.3194	30.2896	39.7416	44.8880	49.4474 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1755.1843 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	167.5926
Water heating fuel used	1751.0843 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	388.2777 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	3894.5463 (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	1755.1843	0.1575	276.4442	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1751.0843	0.1410	246.8402	(264)
Space and water heating			523.2845	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	388.2777	0.1443	56.0405	(268)
Total CO2, kg/year			579.3249	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.2900	(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	1755.1843	1.5830	2778.4864	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1751.0843	1.5212	2663.8156	(278)
Space and water heating			5442.3021	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	388.2777	1.5338	595.5533	(282)
Total Primary energy kWh/year			6037.8553	(286)
Dwelling Primary energy Rate (DPER)			34.3100	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	72.0000 (1b)	x	2.4000 (2b)	=	172.8000 (1b)	-
First floor	64.0000 (1c)	x	2.4000 (2c)	=	153.6000 (1c)	-
Second floor	40.0000 (1d)	x	2.4000 (2d)	=	96.0000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	176.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	422.4000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0947	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3447	(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) =	0.2930	(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	0.3736	0.3662	0.3589	0.3223	0.3150	0.2783	0.2783	0.2710	0.2930	0.3150	0.3296	0.3443	(22b)
Effective ac	0.5698	0.5671	0.5644	0.5519	0.5496	0.5387	0.5387	0.5367	0.5429	0.5496	0.5543	0.5593	(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 Opening Type (Uw = 1.20)			44.0000	1.1450	50.3817			(27)
Heatloss Floor 1			72.0000	0.1300	9.3600			(28a)
External Wall 1	274.0000	44.0000	230.0000	0.1800	41.4000			(29a)
External Roof 1	64.0000		64.0000	0.1100	7.0400			(30)
External Roof 2	8.0000		8.0000	0.1100	0.8800			(30)
Total net area of external elements Aum(A, m2)			418.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		109.0617			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 295.0341 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	46.0000	0.1600	7.3600
E6 Intermediate floor within a dwelling	66.0000	0.0000	0.0000
E16 Corner (normal)	28.8000	0.0900	2.5920
E2 Other lintels (including other steel lintels)	25.0000	0.0500	1.2500
E3 Sill	20.0000	0.0500	1.0000
E4 Jamb	60.0000	0.0500	3.0000
E10 Eaves (insulation at ceiling level)	20.0000	0.0600	1.2000
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.1220 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 126.1837 (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	79.4222	79.0445	78.6743	76.9355	76.6101	75.0957	75.0957	74.8152	75.6790	76.6101	77.2683	77.9563	(38)
Heat transfer coeff	205.6058	205.2282	204.8580	203.1191	202.7938	201.2794	201.2794	200.9989	201.8627	202.7938	203.4519	204.1400	(39)

Average = Sum(39)m / 12 = 203.1176

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1682	1.1661	1.1640	1.1541	1.1522	1.1436	1.1436	1.1420	1.1469	1.1522	1.1560	1.1599	(40)
HLP (average)												1.1541	

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												2.9705	(42)
Hot water usage for mixer showers													
	74.0262	72.9137	71.2926	68.1909	65.9020	63.3494	61.8985	63.5073	65.2709	68.0116	71.1799	73.7425	(42a)
Hot water usage for baths													
	31.9569	31.4823	30.8139	29.5816	28.6589	27.6357	27.0831	27.7467	28.4694	29.5642	30.8219	31.8489	(42b)
Hot water usage for other uses													
	45.0514	43.4131	41.7749	40.1367	38.4984	36.8602	36.8602	38.4984	40.1367	41.7749	43.4131	45.0514	(42c)
Average daily hot water use (litres/day)												138.8345	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	151.0344	147.8091	143.8815	137.9093	133.0594	127.8453	125.8418	129.7525	133.8769	139.3507	145.4149	150.6428	(44)
Energy conte	239.2016	210.4782	221.1404	188.7909	179.1235	157.2008	152.1947	160.6607	165.0836	189.0976	207.1701	235.8702	(45)
Energy content (annual)										Total = Sum(45)m =		2306.0123	
Distribution loss (46)m = 0.15 x (45)m													
	35.8802	31.5717	33.1711	28.3186	26.8685	23.5801	22.8292	24.0991	24.7625	28.3646	31.0755	35.3805	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	285.7965	252.5639	267.7353	233.8827	225.7184	202.2926	198.7896	207.2556	210.1754	235.6925	252.2620	282.4651	(62)
WWHRS	-33.8417	-29.9298	-31.3408	-25.9514	-24.1858	-20.6960	-19.3992	-20.6291	-21.4128	-25.2434	-28.5977	-33.2150	(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													
	251.9548	222.6341	236.3945	207.9313	201.5326	181.5966	179.3905	186.6265	188.7626	210.4491	223.6643	249.2501	(64)
										Total per year (kWh/year) = Sum(64)m =		2540.1870	(64)
12Total per year (kWh/year)												2540	(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													
	116.8105	103.6526	110.8051	98.8464	96.8345	88.3427	87.8807	90.6956	90.9638	100.1509	104.9575	115.7027	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	148.5273	148.5273	148.5273	148.5273	148.5273	148.5273	148.5273	148.5273	148.5273	148.5273	148.5273	148.5273	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	175.3346	194.1204	175.3346	181.1790	175.3346	181.1790	175.3346	175.3346	181.1790	175.3346	181.1790	175.3346	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	347.6204	351.2276	342.1375	322.7859	298.3579	275.3990	260.0611	256.4539	265.5439	284.8956	309.3236	332.2824	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.8527	37.8527	37.8527	37.8527	37.8527	37.8527	37.8527	37.8527	37.8527	37.8527	37.8527	37.8527	(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)													
	-118.8219	-118.8219	-118.8219	-118.8219	-118.8219	-118.8219	-118.8219	-118.8219	-118.8219	-118.8219	-118.8219	-118.8219	(71)
Water heating gains (Table 5)													
	157.0033	154.2449	148.9316	137.2867	130.1539	122.6982	118.1192	121.9027	126.3386	134.6114	145.7744	155.5144	(72)
Total internal gains													
	750.5164	770.1511	736.9619	711.8098	674.4045	646.8345	621.0730	621.2493	640.6198	665.3997	706.8352	733.6897	(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	9.2200	10.6334	0.6300	0.7000	0.7700	29.9623	(74)
East	12.3000	19.6403	0.6300	0.7000	0.7700	73.8285	(76)
South	18.1600	46.7521	0.6300	0.7000	0.7700	259.4708	(78)
West	4.3200	19.6403	0.6300	0.7000	0.7700	25.9300	(80)

Solar gains	389.1916	677.3546	959.9864	1236.7957	1422.4875	1426.9434	1369.7091	1229.9849	1056.2227	758.0649	468.9109	331.2212	(83)
Total gains	1139.7080	1447.5057	1696.9483	1948.6056	2096.8920	2073.7779	1990.7821	1851.2342	1696.8425	1423.4646	1175.7461	1064.9109	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)													
tau	70.1531	70.2822	70.4092	71.0120	71.1259	71.6610	71.6610	71.7610	71.4540	71.1259	70.8958	70.6569	
alpha	5.6769	5.6855	5.6939	5.7341	5.7417	5.7774	5.7774	5.7841	5.7636	5.7417	5.7264	5.7105	
util living area	0.9987	0.9948	0.9819	0.9308	0.8030	0.6055	0.4426	0.4949	0.7569	0.9634	0.9962	0.9991	(86)
MIT	19.7798	20.0087	20.3062	20.6569	20.8923	20.9827	20.9976	20.9955	20.9421	20.6068	20.1175	19.7408	(87)
Th 2	19.9455	19.9472	19.9489	19.9569	19.9584	19.9654	19.9654	19.9666	19.9627	19.9584	19.9554	19.9522	(88)
util rest of house	0.9982	0.9928	0.9747	0.9047	0.7420	0.5149	0.3398	0.3863	0.6685	0.9440	0.9943	0.9988	(89)
MIT 2	18.5272	18.8206	19.1973	19.6268	19.8771	19.9571	19.9648	19.9654	19.9290	19.5795	18.9668	18.4823	(90)
Living area fraction										fLA = Living area / (4) =		0.1534	(91)
MIT	18.7194	19.0029	19.3674	19.7848	20.0328	20.1144	20.1232	20.1234	20.0844	19.7371	19.1433	18.6753	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7194	19.0029	19.3674	19.7848	20.0328	20.1144	20.1232	20.1234	20.0844	19.7371	19.1433	18.6753	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9973	0.9902	0.9694	0.8996	0.7468	0.5284	0.3556	0.4030	0.6798	0.9386	0.9922	0.9981	(94)
Useful gains	1136.6189	1433.2879	1644.9860	1752.9598	1565.9175	1095.7969	707.9718	746.0331	1153.4509	1336.1025	1166.5533	1062.9038	(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	2964.7082	2894.3049	2635.9916	2210.9102	1689.8503	1109.9390	709.1465	748.4050	1208.0344	1852.9456	2450.2404	2954.9937	(97)
Space heating kWh	1360.0984	981.8035	737.3082	329.7243	92.2060	0.0000	0.0000	0.0000	0.0000	384.5313	924.2548	1407.7149	(98a)
Space heating requirement - total per year (kWh/year)												6217.6414	
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	1360.0984	981.8035	737.3082	329.7243	92.2060	0.0000	0.0000	0.0000	0.0000	384.5313	924.2548	1407.7149	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6217.6414	
Space heating per m2											(98c) / (4) =	35.3275	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1360.0984	981.8035	737.3082	329.7243	92.2060	0.0000	0.0000	0.0000	0.0000	384.5313	924.2548	1407.7149	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	1473.5628	1063.7091	798.8171	357.2311	99.8982	0.0000	0.0000	0.0000	0.0000	416.6103	1001.3594	1525.1516	(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	251.9548	222.6341	236.3945	207.9313	201.5326	181.5966	179.3905	186.6265	188.7626	210.4491	223.6643	249.2501	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2618	86.9866	86.4334	85.0887	82.4222	79.8000	79.8000	79.8000	79.8000	85.3935	86.8906	87.3186	(217)
Fuel for water heating, kWh/month	288.7343	255.9407	273.4992	244.3701	244.5124	227.5647	224.8001	233.8678	236.5446	246.4463	257.4091	285.4490	(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	36.4311	29.2263	26.3151	19.2796	14.8921	12.1670	13.5851	17.6584	22.9365	30.0939	33.9910	37.4436	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-64.5769	-89.6548	-126.8880	-140.3214	-149.2377	-138.4000	-136.5048	-129.7561	-117.7212	-101.2112	-70.4242	-55.9787	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-40.8453	-85.3805	-168.7721	-252.2248	-332.3952	-333.7279	-329.9752	-280.0521	-206.0329	-121.8935	-54.4494	-32.3567	(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	6736.3395 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3019.1383 (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)	294.0195 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3558.7804 (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	6576.7169 (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	6736.3395	0.2100	1414.6313	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3019.1383	0.2100	634.0190	(264)
Space and water heating			2048.6503	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	294.0195	0.1443	42.4361	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1320.6749	0.1350	-178.2280	
PV Unit electricity exported	-2238.1055	0.1260	-282.0713	
Total			-460.2993	(269)
Total CO2, kg/year			1642.7164	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3300	(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	6736.3395	1.1300	7612.0637	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3019.1383	1.1300	3411.6262	(278)
Space and water heating			11023.6899	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	294.0195	1.5338	450.9769	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1320.6749	1.4988	-1979.4026	
PV Unit electricity exported	-2238.1055	0.4626	-1035.4072	
Total			-3014.8098	(283)
Total Primary energy kWh/year			8589.9578	(286)
Target Primary Energy Rate (TPER)			48.8100	(287)

Full SAP Calculation Printout

Property Reference	House Type K	Issued on Date	05/10/2023
Assessment Reference	Plot 49	Prop Type Ref	
Property			

SAP Rating	85 B	DER	2.87	TER	7.58
Environmental	97 A	% DER < TER			62.14
CO_2 Emissions (t/year)	0.48	DFEE	29.07	TFEE	32.07
Compliance Check	See BREL	% DFEE < TFEE			9.35
% DPER < TPER	23.75	DPER	30.02	TPER	39.37

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	65.0000 (1b)	x	2.4000 (2b)	=	156.0000 (1b)	-
First floor	72.0000 (1c)	x	2.4000 (2c)	=	172.8000 (1c)	-
Second floor	45.0000 (1d)	x	2.4000 (2d)	=	108.0000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	182.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	436.8000	(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	1 * 10	=	10.0000 (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) =	10.0000 / (5)	=	0.0229 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			4.0000 (17)
Infiltration rate			0.2229 (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)	=	0.1895 (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	0.2416	0.2368	0.2321	0.2084	0.2037	0.1800	0.1800	0.1753	0.1895	0.2037	0.2131	0.2226	(22b)
Effective ac	0.5292	0.5280	0.5269	0.5217	0.5207	0.5162	0.5162	0.5154	0.5179	0.5207	0.5227	0.5248	(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	
Opening Type 1 (Uw = 1.20)			54.4000	1.1450	62.2901			(27)
Heatloss Floor 1			65.0000	0.1200	7.8000	110.0000	7150.0000	(28a)
External Wall 1	163.0000	54.4000	108.6000	0.1900	20.6340	190.0000	20634.0000	(29a)
External Roof 1	46.0000		46.0000	0.1500	6.9000	9.0000	414.0000	(30)
Total net area of external elements Aum(A, m2)			274.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	97.6241			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 28198.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 154.9341 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	30.0000	0.0670	2.0100
E6 Intermediate floor within a dwelling	38.0000	0.0020	0.0760
E16 Corner (normal)	28.8000	0.0410	1.1808
E2 Other lintels (including other steel lintels)	21.2500	0.0240	0.5100
E3 Sill	15.3500	0.0190	0.2916
E4 Jamb	72.4000	0.0140	1.0136
E10 Eaves (insulation at ceiling level)	18.0000	0.0460	0.8280
E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3061 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 103.9301 (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	76.2775	76.1142	75.9542	75.2023	75.0616	74.4068	74.4068	74.2855	74.6590	75.0616	75.3462	75.6437	(38)
Heat transfer coeff	180.2077	180.0443	179.8843	179.1324	178.9918	178.3369	178.3369	178.2156	178.5891	178.9918	179.2763	179.5738	(39)

Average = Sum(39)m / 12 = 179.1318

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9902	0.9893	0.9884	0.9842	0.9835	0.9799	0.9799	0.9792	0.9813	0.9835	0.9850	0.9867	(40)
HLP (average)												0.9842	
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 2.9784 (42)
Hot water usage for mixer showers

74.1585	73.0440	71.4200	68.3128	66.0198	63.4626	62.0091	63.6208	65.3875	68.1332	71.3071	73.8743	(42a)

Hot water usage for baths

32.0138	31.5383	30.8688	29.6343	28.7099	27.6849	27.1313	27.7961	28.5200	29.6168	30.8767	31.9056	(42b)

Hot water usage for other uses

45.1322	43.4910	41.8498	40.2087	38.5675	36.9263	36.9263	38.5675	40.2087	41.8498	43.4910	45.1322	(42c)

Average daily hot water use (litres/day) 139.0827 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.3045	148.0734	144.1387	138.1558	133.2972	128.0739	126.0668	129.9845	134.1163	139.5998	145.6749	150.9121	(44)
Energy conte	239.6293	210.8545	221.5358	189.1284	179.4437	157.4818	152.4668	160.9479	165.3788	189.4356	207.5405	236.2919	(45)

Energy content (annual) Total = Sum(45)m = 2310.1351
Distribution loss (46)m = 0.15 x (45)m

35.9444	31.6282	33.2304	28.3693	26.9166	23.6223	22.8700	24.1422	24.8068	28.4153	31.1311	35.4438	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

293.0237	259.0817	274.9302	240.8004	232.8381	209.1538	205.8612	214.3423	217.0508	242.8300	259.2125	289.6863	(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

293.0237	259.0817	274.9302	240.8004	232.8381	209.1538	205.8612	214.3423	217.0508	242.8300	259.2125	289.6863	(64)

Total per year (kWh/year) = Sum(64)m = 2938.8111 (64)
12Total per year (kWh/year) 2939 (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

122.3923	108.6909	116.3762	104.2228	102.3806	93.7003	93.4107	96.2307	96.3260	105.7029	110.3448	121.2826	(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	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	178.3502	197.4592	178.3502	184.2952	178.3502	184.2952	178.3502	178.3502	184.2952	178.3502	184.2952	178.3502	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	353.5993	357.2685	348.0221	328.3376	303.4895	280.1357	264.5340	260.8647	270.1111	289.7956	314.6438	337.9975	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	(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)	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	(71)

Water heating gains (Table 5)

	164.5057	161.7424	156.4196	144.7539	137.6083	130.1393	125.5521	129.3423	133.7862	142.0738	153.2567	163.0142 (72)

Total internal gains

	764.1318	784.1467	750.4685	725.0633	687.1245	662.2468	636.1129	636.2339	655.8691	677.8962	719.8723	747.0385 (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	17.2500	10.6334	0.7600	0.7000	0.7700	67.6248 (74)
East	5.1500	19.6403	0.7600	0.7000	0.7700	37.2906 (76)
South	26.7500	46.7521	0.7600	0.7000	0.7700	461.0727 (78)
West	5.2500	19.6403	0.7600	0.7000	0.7700	38.0147 (80)

Solar gains	604.0028	1031.6659	1424.0914	1793.6993	2041.6582	2042.8022	1962.7424	1774.2742	1550.9939	1143.1021	723.8491	516.7120 (83)
Total gains	1368.1346	1815.8125	2174.5599	2518.7626	2728.7828	2705.0491	2598.8552	2410.5081	2206.8630	1820.9983	1443.7214	1263.7506 (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	43.4653	43.5047	43.5434	43.7262	43.7606	43.9212	43.9212	43.9511	43.8592	43.7606	43.6911	43.6187	
alpha	3.8977	3.9003	3.9029	3.9151	3.9174	3.9281	3.9281	3.9301	3.9239	3.9174	3.9127	3.9079	
util living area	0.9742	0.9330	0.8614	0.7329	0.5724	0.4136	0.3000	0.3368	0.5318	0.8053	0.9466	0.9803	(86)
Living	19.5267	19.9412	20.3537	20.7169	20.9096	20.9801	20.9956	20.9931	20.9484	20.6522	20.0098	19.4362	
Non living	18.3780	18.8944	19.3950	19.8157	20.0192	20.0869	20.0982	20.0974	20.0613	19.7574	18.9899	18.2658	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	21	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	10	28	30	0	0	0	0	0	0	0	0	31	
MIT	20.7308	20.4003	20.6249	20.7169	20.9096	20.9801	20.9956	20.9931	20.9484	20.6522	20.0098	20.1143	(87)
Th 2	20.0915	20.0923	20.0930	20.0965	20.0971	20.1001	20.1001	20.1007	20.0990	20.0971	20.0958	20.0945	(88)
util rest of house	0.9693	0.9214	0.8399	0.6976	0.5255	0.3583	0.2395	0.2724	0.4704	0.7684	0.9354	0.9765	(89)
MIT 2	19.8476	19.5636	19.7723	19.8157	20.0192	20.0869	20.0982	20.0974	20.0613	19.7574	18.9899	19.2873	(90)
Living area fraction									fLA = Living area / (4) =			0.0934	(91)
MIT	19.9301	19.6417	19.8520	19.8999	20.1024	20.1703	20.1820	20.1810	20.1442	19.8410	19.0852	19.3646	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9301	19.6417	19.8520	19.8999	20.1024	20.1703	20.1820	20.1810	20.1442	19.8410	19.0852	19.3646	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9683	0.9149	0.8336	0.6894	0.5258	0.3627	0.2451	0.2782	0.4736	0.7567	0.9193	0.9727	(94)
Useful gains	1324.7020	1661.2677	1812.6756	1736.3553	1434.8364	981.0206	636.8534	670.5924	1045.0853	1377.9038	1327.2534	1229.2385	(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	2816.6582	2654.1630	2401.8103	1970.4327	1503.9612	993.3963	638.8008	673.8393	1079.4281	1654.0622	2148.6567	2723.1611	(97)
Space heating kWh	1110.0154	667.2256	438.3162	168.5357	51.4288	0.0000	0.0000	0.0000	0.0000	205.4619	591.4104	1111.4784	(98a)
Space heating requirement - total per year (kWh/year)												4343.8724	
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	1110.0154	667.2256	438.3162	168.5357	51.4288	0.0000	0.0000	0.0000	0.0000	205.4619	591.4104	1111.4784	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4343.8724	
Space heating per m2											(98c) / (4) =	23.8674	(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 %)	312.6509 (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	1110.0154	667.2256	438.3162	168.5357	51.4288	0.0000	0.0000	0.0000	0.0000	205.4619	591.4104	1111.4784	(98)
Space heating efficiency (main heating system 1)	312.6509	312.6509	312.6509	312.6509	312.6509	0.0000	0.0000	0.0000	0.0000	312.6509	312.6509	312.6509	(210)
Space heating fuel (main heating system)	355.0334	213.4091	140.1935	53.9054	16.4493	0.0000	0.0000	0.0000	0.0000	65.7161	189.1600	355.5014	(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

293.0237	259.0817	274.9302	240.8004	232.8381	209.1538	205.8612	214.3423	217.0508	242.8300	259.2125	289.6863 (64)

Efficiency of water heater 168.2132 (216)

(217)m 168.2132	168.2132	168.2132	168.2132	168.2132	168.2132	168.2132	168.2132	168.2132	168.2132	168.2132	168.2132 (217)

Fuel for water heating, kWh/month

174.1978	154.0199	163.4415	143.1519	138.4185	124.3385	122.3812	127.4230	129.0332	144.3585	154.0977	172.2138 (219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting 48.9927	39.3037	35.3887	25.9273	20.0270	16.3622	18.2693	23.7471	30.8451	40.4704	45.7113	50.3543 (232)

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

(233a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

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

(233b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	1389.3681 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	168.2132
Water heating fuel used	1747.0755 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	395.3989 (232)

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

PV generation	0.0000 (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	3531.8425 (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	1389.3681	0.1575	218.7925	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1747.0755	0.1410	246.2767	(264)
Space and water heating			465.0692	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	395.3989	0.1443	57.0683	(268)
Total CO2, kg/year			522.1375	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.8700	(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	1389.3681	1.5829	2199.2553	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1747.0755	1.5212	2657.7230	(278)
Space and water heating			4856.9783	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	395.3989	1.5338	606.4761	(282)
Total Primary energy kWh/year			5463.4544	(286)
Dwelling Primary energy Rate (DPER)			30.0200	(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	65.0000 (1b)	x	2.4000 (2b)	=	156.0000 (1b)	-
First floor	72.0000 (1c)	x	2.4000 (2c)	=	172.8000 (1c)	-
Second floor	45.0000 (1d)	x	2.4000 (2d)	=	108.0000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	182.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	436.8000	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0916	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3416	(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) =	0.2903	(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	0.3702	0.3629	0.3557	0.3194	0.3121	0.2758	0.2758	0.2686	0.2903	0.3121	0.3266	0.3411	(22b)
Effective ac	0.5685	0.5659	0.5632	0.5510	0.5487	0.5380	0.5380	0.5361	0.5421	0.5487	0.5533	0.5582	(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 Opening Type (Uw = 1.20)			45.5000	1.1450	52.0992			(27)
Heatloss Floor 1			65.0000	0.1300	8.4500			(28a)
External Wall 1	163.0000	45.5000	117.5000	0.1800	21.1500			(29a)
External Roof 1	46.0000		46.0000	0.1100	5.0600			(30)
Total net area of external elements Aum(A, m2)			274.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		86.7592			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 154.9341 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	30.0000	0.1600	4.8000
E6 Intermediate floor within a dwelling	38.0000	0.0000	0.0000
E16 Corner (normal)	28.8000	0.0900	2.5920
E2 Other lintels (including other steel lintels)	21.2500	0.0500	1.0625
E3 Sill	15.3500	0.0500	0.7675
E4 Jamb	72.4000	0.0500	3.6200
E10 Eaves (insulation at ceiling level)	18.0000	0.0600	1.0800
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.6420	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	101.4012	(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	81.9484	81.5649	81.1889	79.4233	79.0929	77.5551	77.5551	77.2703	78.1474	79.0929	79.7612	80.4599	(38)
Heat transfer coeff	183.3496	182.9661	182.5902	180.8245	180.4942	178.9563	178.9563	178.6715	179.5487	180.4942	181.1624	181.8611	(39)
Average = Sum(39)m / 12 =												180.8229	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0074	1.0053	1.0032	0.9935	0.9917	0.9833	0.9833	0.9817	0.9865	0.9917	0.9954	0.9992	(40)
HLP (average)												0.9935	
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 2.9784 (42)

Hot water usage for mixer showers

74.1585	73.0440	71.4200	68.3128	66.0198	63.4626	62.0091	63.6208	65.3875	68.1332	71.3071	73.8743 (42a)

Hot water usage for baths

32.0138	31.5383	30.8688	29.6343	28.7099	27.6849	27.1313	27.7961	28.5200	29.6168	30.8767	31.9056 (42b)

Hot water usage for other uses

45.1322	43.4910	41.8498	40.2087	38.5675	36.9263	36.9263	38.5675	40.2087	41.8498	43.4910	45.1322 (42c)

Average daily hot water use (litres/day) 139.0827 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.3045	148.0734	144.1387	138.1558	133.2972	128.0739	126.0668	129.9845	134.1163	139.5998	145.6749	150.9121	(44)
Energy conte	239.6293	210.8545	221.5358	189.1284	179.4437	157.4818	152.4668	160.9479	165.3788	189.4356	207.5405	236.2919	(45)
Energy content (annual)										Total = Sum(45)m =		2310.1351	
Distribution loss (46)m = 0.15 x (45)m													
	35.9444	31.6282	33.2304	28.3693	26.9166	23.6223	22.8700	24.1422	24.8068	28.4153	31.1311	35.4438	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	286.2242	252.9402	268.1307	234.2203	226.0386	202.5737	199.0617	207.5428	210.4706	236.0305	252.6324	282.8868	(62)
WWHRS	-33.9022	-29.9833	-31.3968	-25.9978	-24.2290	-20.7330	-19.4338	-20.6659	-21.4511	-25.2885	-28.6488	-33.2743	(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													
	252.3220	222.9569	236.7339	208.2224	201.8096	181.8407	179.6279	186.8769	189.0195	210.7421	223.9836	249.6124	(64)
										Total per year (kWh/year) = Sum(64)m =		2543.7478	(64)
12Total per year (kWh/year)												2544	(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													
	116.9527	103.7777	110.9366	98.9587	96.9410	88.4362	87.9711	90.7911	91.0619	100.2633	105.0807	115.8430	(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	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	178.3502	197.4592	178.3502	184.2952	178.3502	184.2952	178.3502	178.3502	184.2952	178.3502	184.2952	178.3502	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	353.5993	357.2685	348.0221	328.3376	303.4895	280.1357	264.5340	260.8647	270.1111	289.7956	314.6438	337.9975	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	(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)													
	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	(71)
Water heating gains (Table 5)													
	157.1944	154.4311	149.1083	137.4426	130.2970	122.8280	118.2408	122.0311	126.4749	134.7625	145.9454	155.7029	(72)
Total internal gains													
	759.8205	779.8354	746.1572	720.7520	682.8133	654.9356	628.8016	628.9226	648.5578	673.5849	715.5610	742.7272	(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	14.4300	10.6334	0.6300	0.7000	0.7700	46.8932	(74)
East	4.3100	19.6403	0.6300	0.7000	0.7700	25.8700	(76)
South	22.3700	46.7521	0.6300	0.7000	0.7700	319.6234	(78)
West	4.3900	19.6403	0.6300	0.7000	0.7700	26.3502	(80)

Solar gains	418.7368	715.2299	987.3073	1243.5799	1415.5140	1416.3166	1360.8056	1230.1214	1075.2969	792.4910	501.8240	358.2199	(83)
Total gains	1178.5573	1495.0653	1733.4645	1964.3319	2098.3272	2071.2521	1989.6071	1859.0440	1723.8547	1466.0759	1217.3850	1100.9471	(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	42.7205	42.8100	42.8981	43.3170	43.3963	43.7692	43.7692	43.8390	43.6248	43.3963	43.2362	43.0701	
alpha	3.8480	3.8540	3.8599	3.8878	3.8931	3.9179	3.9179	3.9226	3.9083	3.8931	3.8824	3.8713	
util living area													
	0.9842	0.9625	0.9228	0.8359	0.6990	0.5273	0.3894	0.4319	0.6494	0.8808	0.9684	0.9876	(86)
MIT	19.3365	19.6814	20.0824	20.5207	20.8138	20.9532	20.9888	20.9833	20.8949	20.4854	19.8248	19.2749	(87)
Th 2	20.0772	20.0789	20.0806	20.0887	20.0902	20.0973	20.0973	20.0986	20.0946	20.0902	20.0872	20.0840	(88)
util rest of house													
	0.9810	0.9553	0.9083	0.8070	0.6509	0.4611	0.3122	0.3515	0.5831	0.8525	0.9611	0.9851	(89)
MIT 2	18.1282	18.5641	19.0637	19.5953	19.9229	20.0649	20.0921	20.0902	20.0142	19.5682	18.7554	18.0546	(90)
Living area fraction										fLA = Living area / (4) =		0.0934	(91)
MIT	18.2411	18.6685	19.1588	19.6817	20.0061	20.1479	20.1758	20.1736	20.0965	19.6539	18.8552	18.1686	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2411	18.6685	19.1588	19.6817	20.0061	20.1479	20.1758	20.1736	20.0965	19.6539	18.8552	18.1686	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9719	0.9409	0.8906	0.7924	0.6462	0.4650	0.3191	0.3583	0.5832	0.8364	0.9477	0.9774	(94)
Useful gains	1145.4921	1406.6769	1543.8776	1556.5443	1355.9194	963.0391	634.7976	666.1448	1005.3647	1226.2318	1153.7673	1076.0170	(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													
	2556.0917	2519.1671	2311.3767	1949.5980	1499.1986	992.8262	639.9153	674.2419	1076.6578	1634.1760	2129.6093	2540.3494	(97)
Space heating kWh													
	1049.4861	747.5934	571.0194	282.9987	106.5997	0.0000	0.0000	0.0000	0.0000	303.5105	702.6062	1089.4633	(98a)
Space heating requirement - total per year (kWh/year)												4853.2773	
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													
	1049.4861	747.5934	571.0194	282.9987	106.5997	0.0000	0.0000	0.0000	0.0000	303.5105	702.6062	1089.4633	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4853.2773	
Space heating per m2											(98c) / (4) =	26.6664	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1049.4861	747.5934	571.0194	282.9987	106.5997	0.0000	0.0000	0.0000	0.0000	303.5105	702.6062	1089.4633	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	1137.0380	809.9604	618.6559	306.6074	115.4927	0.0000	0.0000	0.0000	0.0000	328.8304	761.2202	1180.3502	(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													
	252.3220	222.9569	236.7339	208.2224	201.8096	181.8407	179.6279	186.8769	189.0195	210.7421	223.9836	249.6124	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.9004	86.5574	85.9587	84.7484	82.6970	79.8000	79.8000	79.8000	79.8000	84.8771	86.4433	86.9716	(217)
Fuel for water heating, kWh/month													
	290.3578	257.5826	275.4041	245.6947	244.0349	227.8705	225.0976	234.1816	236.8665	248.2908	259.1103	287.0046	(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	37.0577	29.7290	26.7677	19.6112	15.1482	12.3762	13.8187	17.9621	23.3310	30.6115	34.5756	38.0876	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-60.0003	-84.1803	-120.3819	-134.5579	-144.3054	-134.2544	-132.4248	-125.2984	-112.7632	-95.7038	-65.7496	-51.9075	(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	-35.1725	-73.8376	-146.5335	-219.8240	-290.5020	-291.9722	-288.7029	-244.6674	-179.5148	-105.7101	-46.9836	-27.8397	(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												5258.1552	(211)

Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3031.4961 (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)	299.0765 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3212.7879 (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	5461.9399 (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	5258.1552	0.2100	1104.2126	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3031.4961	0.2100	636.6142	(264)
Space and water heating			1740.8268	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	299.0765	0.1443	43.1660	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1261.5274	0.1347	-169.9624	
PV Unit electricity exported	-1951.2605	0.1259	-245.6972	
Total			-415.6597	(269)
Total CO2, kg/year			1380.2623	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.5800	(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	5258.1552	1.1300	5941.7154	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3031.4961	1.1300	3425.5906	(278)
Space and water heating			9367.3060	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	299.0765	1.5338	458.7335	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1261.5274	1.4979	-1889.6902	
PV Unit electricity exported	-1951.2605	0.4622	-901.8773	
Total			-2791.5675	(283)
Total Primary energy kWh/year			7164.5728	(286)
Target Primary Energy Rate (TPER)			39.3700	(287)

Full SAP Calculation Printout

Property Reference	House Type R	Issued on Date	05/10/2023
Assessment Reference	Plot 50	Prop Type Ref	
Property			

SAP Rating	85 B	DER	2.75	TER	7.25
Environmental	97 A	% DER < TER			62.07
CO_2 Emissions (t/year)	0.57	DFEE	30.32	TFEE	33.52
Compliance Check	See BREL	% DFEE < TFEE			9.54
% DPER < TPER	23.94	DPER	28.70	TPER	37.74

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	84.0000	(1b)	x 2.4000	(2b) =	201.6000	(1b) -
First floor	72.0000	(1c)	x 2.4000	(2c) =	172.8000	(1c) -
Second floor	72.0000	(1d)	x 2.4000	(2d) =	172.8000	(1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	228.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		547.2000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0183	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2183	(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) =	0.1855	(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	0.2366	0.2319	0.2273	0.2041	0.1994	0.1763	0.1763	0.1716	0.1855	0.1994	0.2087	0.2180	(22b)
Effective ac	0.5280	0.5269	0.5258	0.5208	0.5199	0.5155	0.5155	0.5147	0.5172	0.5199	0.5218	0.5238	(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	
Opening Type 1 (Uw = 1.20)			52.4000	1.1450	60.0000			(27)
Heatloss Floor 1			72.0000	0.1200	8.6400	110.0000	7920.0000	(28a)
External Wall 1	177.0000	52.4000	124.6000	0.1900	23.6740	190.0000	23674.0000	(29a)
External Roof 1	72.0000		72.0000	0.1500	10.8000	9.0000	648.0000	(30)
External Roof 2	12.0000		12.0000	0.1500	1.8000	9.0000	108.0000	(30)
Total net area of external elements Aum(A, m2)			333.0000					(31)

Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 104.9140 (33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 32350.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 141.8860 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E5 Ground floor (normal)	46.0000	0.0670	3.0820
	E6 Intermediate floor within a dwelling	66.0000	0.0020	0.1320
	E16 Corner (normal)	28.8000	0.0410	1.1808
	E2 Other lintels (including other steel lintels)	25.0000	0.0240	0.6000
	E3 Sill	20.0000	0.0190	0.3800
	E4 Jamb	60.0000	0.0140	0.8400
	E10 Eaves (insulation at ceiling level)	20.0000	0.0460	0.9200
	E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5308 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 112.4448 (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	95.3404	95.1442	94.9519	94.0486	93.8796	93.0929	93.0929	92.9472	93.3960	93.8796	94.2215	94.5789	(38)
Heat transfer coeff	207.7852	207.5890	207.3967	206.4934	206.3244	205.5377	205.5377	205.3920	205.8408	206.3244	206.6663	207.0237	(39)

Average = Sum(39)m / 12 = 206.4926

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9113	0.9105	0.9096	0.9057	0.9049	0.9015	0.9015	0.9008	0.9028	0.9049	0.9064	0.9080	(40)
HLP (average)												0.9057	
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 3.0383 (42)
Hot water usage for mixer showers

75.1627	74.0331	72.3871	69.2379	66.9138	64.3220	62.8488	64.4823	66.2730	69.0558	72.2727	74.8747	(42a)

Hot water usage for baths

32.4456	31.9638	31.2852	30.0341	29.0972	28.0584	27.4973	28.1711	28.9048	30.0163	31.2932	32.3359	(42b)

Hot water usage for other uses

45.7455	44.0821	42.4186	40.7551	39.0916	37.4282	37.4282	39.0916	40.7551	42.4186	44.0821	45.7455	(42c)

Average daily hot water use (litres/day) 140.9665 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	153.3538	150.0790	146.0909	140.0270	135.1026	129.8085	127.7743	131.7451	135.9328	141.4907	147.6480	152.9562	(44)
Energy conte	242.8750	213.7104	224.5363	191.6900	181.8741	159.6148	154.5319	163.1279	167.6188	192.0015	210.3516	239.4924	(45)

Energy content (annual) Total = Sum(45)m = 2341.4248

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

36.4312	32.0566	33.6805	28.7535	27.2811	23.9422	23.1798	24.4692	25.1428	28.8002	31.5527	35.9239	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

296.2694	261.9376	277.9307	243.3620	235.2685	211.2868	207.9263	216.5223	219.2908	245.3959	262.0236	292.8868	(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

296.2694	261.9376	277.9307	243.3620	235.2685	211.2868	207.9263	216.5223	219.2908	245.3959	262.0236	292.8868	(64)

Total per year (kWh/year) = Sum(64)m = 2970.1008 (64)
12Total per year (kWh/year) 2970 (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

123.4715	109.6405	117.3739	105.0745	103.1887	94.4095	94.0974	96.9555	97.0708	106.5560	111.2795	122.3467	(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	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	200.2084	221.6593	200.2084	206.8820	200.2084	206.8820	200.2084	200.2084	206.8820	200.2084	206.8820	200.2084	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.9356	401.0546	390.6749	368.5780	340.6845	314.4686	296.9547	292.8358	303.2154	325.3124	353.2058	379.4218	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	(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)													

	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332 (71)
Water heating gains (Table 5)												
	165.9563	163.1555	157.7606	145.9369	138.6944	131.1243	126.4750	130.3166	134.8206	143.2205	154.5549	164.4445 (72)
Total internal gains												
	831.6752	854.4443	817.2189	789.9718	748.1623	721.0499	692.2130	691.9357	713.4930	737.3162	783.2177	812.6497 (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	23.4000	10.6334	0.7600	0.7000	0.7700	91.7345 (74)
East	8.5000	19.6403	0.7600	0.7000	0.7700	61.5476 (76)
South	16.5000	46.7521	0.7600	0.7000	0.7700	284.4000 (78)
West	4.0000	19.6403	0.7600	0.7000	0.7700	28.9636 (80)

Solar gains	466.6457	818.1423	1182.7977	1574.3341	1864.5344	1896.0373	1809.2246	1585.5178	1317.0826	921.1592	563.1341	396.6542 (83)
Total gains	1298.3209	1672.5866	2000.0166	2364.3059	2612.6967	2617.0871	2501.4377	2277.4535	2030.5756	1658.4754	1346.3518	1209.3038 (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	43.2471	43.2880	43.3281	43.5177	43.5533	43.7200	43.7200	43.7510	43.6556	43.5533	43.4813	43.4062	
alpha	3.8831	3.8859	3.8885	3.9012	3.9036	3.9147	3.9147	3.9167	3.9104	3.9036	3.8988	3.8937	
util living area													
	0.9861	0.9649	0.9206	0.8173	0.6595	0.4851	0.3572	0.4070	0.6366	0.8842	0.9716	0.9893	(86)
Living	19.3251	19.6776	20.1077	20.5662	20.8499	20.9648	20.9917	20.9863	20.9022	20.4793	19.8015	19.2530	
Non living	18.1771	18.6231	19.1590	19.7110	20.0262	20.1410	20.1621	20.1594	20.0873	19.6236	18.7864	18.0873	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	0	0	0	0	0	0	0	0	0	0	12	
16 / 9	0	28	31	0	0	0	0	0	0	0	19	19	
MIT	21.0000	20.2511	20.4946	20.5662	20.8499	20.9648	20.9917	20.9863	20.9022	20.4793	20.1307	20.3936	(87)
Th 2	20.1579	20.1586	20.1593	20.1627	20.1633	20.1662	20.1662	20.1668	20.1651	20.1633	20.1620	20.1607	(88)
util rest of house													
	0.9835	0.9587	0.9071	0.7894	0.6150	0.4273	0.2913	0.3364	0.5759	0.8588	0.9656	0.9872	(89)
MIT 2	20.1579	19.4809	19.7178	19.7110	20.0262	20.1410	20.1621	20.1594	20.0873	19.6236	19.2731	19.5998	(90)
Living area fraction										fLA = Living area / (4) =		0.0833	(91)
MIT	20.2281	19.5450	19.7825	19.7823	20.0948	20.2096	20.2312	20.2283	20.1553	19.6949	19.3446	19.6659	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2281	19.5450	19.7825	19.7823	20.0948	20.2096	20.2312	20.2283	20.1553	19.6949	19.3446	19.6659	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9534	0.9003	0.7753	0.6111	0.4304	0.2965	0.3417	0.5751	0.8421	0.9581	0.9858	(94)
Useful gains	1277.2582	1594.5811	1800.5367	1832.9435	1596.6987	1126.4557	741.7334	778.2719	1167.8804	1396.5606	1289.9757	1192.1743	(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													
	3309.6127	3040.1504	2754.7545	2247.1211	1732.0530	1152.9884	746.3467	786.3077	1246.4177	1876.5090	2530.5385	3201.8166	(97)
Space heating kWh													
	1512.0718	971.4226	709.9380	298.2079	100.7036	0.0000	0.0000	0.0000	0.0000	357.0816	893.2052	1495.1738	(98a)
Space heating requirement - total per year (kWh/year)												6337.8045	
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													
	1512.0718	971.4226	709.9380	298.2079	100.7036	0.0000	0.0000	0.0000	0.0000	357.0816	893.2052	1495.1738	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6337.8045	
Space heating per m2											(98c) / (4) =	27.7974	(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 %)	317.4990 (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													
	1512.0718	971.4226	709.9380	298.2079	100.7036	0.0000	0.0000	0.0000	0.0000	357.0816	893.2052	1495.1738	(98)
Space heating efficiency (main heating system 1)													
	317.4990	317.4990	317.4990	317.4990	317.4990	0.0000	0.0000	0.0000	0.0000	317.4990	317.4990	317.4990	(210)
Space heating fuel (main heating system)													
	476.2445	305.9608	223.6032	93.9240	31.7178	0.0000	0.0000	0.0000	0.0000	112.4670	281.3253	470.9223	(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												
	296.2694	261.9376	277.9307	243.3620	235.2685	211.2868	207.9263	216.5223	219.2908	245.3959	262.0236	292.8868 (64)
Efficiency of water heater												167.0527 (216)
(217)m	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527 (217)
Fuel for water heating, kWh/month												
	177.3509	156.7994	166.3731	145.6798	140.8349	126.4791	124.4675	129.6132	131.2704	146.8973	156.8509	175.3260 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	55.3618	44.4133	39.9893	29.2979	22.6305	18.4893	20.6443	26.8343	34.8550	45.7317	51.6539	56.9005 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1996.1650 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	167.0527
Water heating fuel used	1777.9423 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	446.8018 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	4220.9091 (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	1996.1650	0.1568	312.9467	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1777.9423	0.1410	250.6393	(264)
Space and water heating			563.5860	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	446.8018	0.1443	64.4873	(268)
Total CO2, kg/year			628.0733	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.7500	(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	1996.1650	1.5803	3154.6318	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1777.9423	1.5213	2704.7219	(278)
Space and water heating			5859.3537	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	446.8018	1.5338	685.3196	(282)
Total Primary energy kWh/year			6544.6733	(286)
Dwelling Primary energy Rate (DPER)			28.7000	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	84.0000 (1b)	x	2.4000 (2b)	=	201.6000 (1b)	-
First floor	72.0000 (1c)	x	2.4000 (2c)	=	172.8000 (1c)	-
Second floor	72.0000 (1d)	x	2.4000 (2d)	=	172.8000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	228.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	547.2000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0731 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3231 (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) =	0.2746 (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	0.3502	0.3433	0.3364	0.3021	0.2952	0.2609	0.2609	0.2540	0.2746	0.2952	0.3090	0.3227	(22b)
Effective ac	0.5613	0.5589	0.5566	0.5456	0.5436	0.5340	0.5340	0.5323	0.5377	0.5436	0.5477	0.5521	(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 Opening Type (Uw = 1.20)			52.4000	1.1450	60.0000			(27)
Heatloss Floor 1			72.0000	0.1300	9.3600			(28a)
External Wall 1	177.0000	52.4000	124.6000	0.1800	22.4280			(29a)
External Roof 1	72.0000		72.0000	0.1100	7.9200			(30)
External Roof 2	12.0000		12.0000	0.1100	1.3200			(30)
Total net area of external elements Aum(A, m2)			333.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	101.0280			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 141.8860 (35)

List of Thermal Bridges

	Length	Psi-value	Total
E5 Ground floor (normal)	46.0000	0.1600	7.3600
E6 Intermediate floor within a dwelling	66.0000	0.0000	0.0000
E16 Corner (normal)	28.8000	0.0900	2.5920
E2 Other lintels (including other steel lintels)	25.0000	0.0500	1.2500
E3 Sill	20.0000	0.0500	1.0000
E4 Jamb	60.0000	0.0500	3.0000
E10 Eaves (insulation at ceiling level)	20.0000	0.0600	1.2000
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.1220 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 118.1500 (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	101.3583	100.9285	100.5071	98.5280	98.1577	96.4339	96.4339	96.1147	97.0979	98.1577	98.9068	99.6899	(38)
Heat transfer coeff	219.5083	219.0785	218.6571	216.6780	216.3077	214.5839	214.5839	214.2647	215.2479	216.3077	217.0568	217.8399	(39)

Average = Sum(39)m / 12 = 216.6762

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9628	0.9609	0.9590	0.9503	0.9487	0.9412	0.9412	0.9398	0.9441	0.9487	0.9520	0.9554	(40)
HLP (average)												0.9503	

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												3.0383	(42)
Hot water usage for mixer showers													
	75.1627	74.0331	72.3871	69.2379	66.9138	64.3220	62.8488	64.4823	66.2730	69.0558	72.2727	74.8747	(42a)
Hot water usage for baths													
	32.4456	31.9638	31.2852	30.0341	29.0972	28.0584	27.4973	28.1711	28.9048	30.0163	31.2932	32.3359	(42b)
Hot water usage for other uses													
	45.7455	44.0821	42.4186	40.7551	39.0916	37.4282	37.4282	39.0916	40.7551	42.4186	44.0821	45.7455	(42c)
Average daily hot water use (litres/day)												140.9665	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	153.3538	150.0790	146.0909	140.0270	135.1026	129.8085	127.7743	131.7451	135.9328	141.4907	147.6480	152.9562	(44)
Energy conte	242.8750	213.7104	224.5363	191.6900	181.8741	159.6148	154.5319	163.1279	167.6188	192.0015	210.3516	239.4924	(45)
Energy content (annual)											Total = Sum(45)m =	2341.4248	
Distribution loss (46)m = 0.15 x (45)m													
	36.4312	32.0566	33.6805	28.7535	27.2811	23.9422	23.1798	24.4692	25.1428	28.8002	31.5527	35.9239	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	289.4699	255.7961	271.1312	236.7819	228.4690	204.7066	201.1268	209.7228	212.7106	238.5964	255.4435	286.0873	(62)
WWHRS	-34.3612	-30.3894	-31.8220	-26.3499	-24.5571	-21.0137	-19.6970	-20.9458	-21.7416	-25.6309	-29.0367	-33.7249	(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													
	255.1087	225.4068	239.3093	210.4320	203.9119	183.6929	181.4298	188.7770	190.9690	212.9655	226.4067	252.3624	(64)
										Total per year (kWh/year) = Sum(64)m =		2570.7720	(64)
12Total per year (kWh/year)												2571	(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													
	118.0319	104.7273	111.9343	99.8104	97.7491	89.1454	88.6578	91.5160	91.8067	101.1164	106.0154	116.9071	(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	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	200.2084	221.6593	200.2084	206.8820	200.2084	206.8820	200.2084	200.2084	206.8820	200.2084	206.8820	200.2084	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	396.9356	401.0546	390.6749	368.5780	340.6845	314.4686	296.9547	292.8358	303.2154	325.3124	353.2058	379.4218	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	(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)													
	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	(71)
Water heating gains (Table 5)													
	158.6450	155.8442	150.4493	138.6256	131.3832	123.8130	119.1637	123.0053	127.5093	135.9092	147.2436	157.1333	(72)
Total internal gains													
	827.3640	850.1330	812.9076	785.6605	743.8510	713.7386	684.9018	684.6244	706.1817	733.0049	778.9064	808.3384	(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	23.4000	10.6334	0.6300	0.7000	0.7700	76.0430	(74)
East	8.5000	19.6403	0.6300	0.7000	0.7700	51.0197	(76)
South	16.5000	46.7521	0.6300	0.7000	0.7700	235.7526	(78)
West	4.0000	19.6403	0.6300	0.7000	0.7700	24.0093	(80)

Solar gains	386.8247	678.1969	980.4770	1305.0401	1545.6009	1571.7151	1499.7520	1314.3108	1091.7921	763.5925	466.8085	328.8054	(83)
Total gains	1214.1886	1528.3299	1793.3846	2090.7006	2289.4519	2285.4537	2184.6538	1998.9352	1797.9738	1496.5974	1245.7149	1137.1438	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)													
tau	40.9374	41.0178	41.0968	41.4722	41.5432	41.8769	41.8769	41.9393	41.7477	41.5432	41.3998	41.2510	
alpha	3.7292	3.7345	3.7398	3.7648	3.7695	3.7918	3.7918	3.7960	3.7832	3.7695	3.7600	3.7501	
util living area	0.9891	0.9746	0.9447	0.8691	0.7365	0.5628	0.4218	0.4754	0.7097	0.9159	0.9786	0.9914	(86)
MIT	19.1429	19.4639	19.8865	20.3914	20.7537	20.9340	20.9828	20.9732	20.8415	20.3352	19.6410	19.0879	(87)
Th 2	20.1145	20.1161	20.1176	20.1249	20.1263	20.1327	20.1327	20.1338	20.1302	20.1263	20.1235	20.1206	(88)
util rest of house	0.9870	0.9698	0.9343	0.8454	0.6925	0.4977	0.3429	0.3927	0.6478	0.8952	0.9738	0.9897	(89)
MIT 2	17.9169	18.3252	18.8575	19.4799	19.8959	20.0842	20.1239	20.1192	20.0007	19.4265	18.5584	17.8508	(90)
Living area fraction										fLA = Living area / (4) =		0.0833	(91)
MIT	18.0191	18.4201	18.9433	19.5558	19.9674	20.1550	20.1955	20.1904	20.0707	19.5022	18.6486	17.9539	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0191	18.4201	18.9433	19.5558	19.9674	20.1550	20.1955	20.1904	20.0707	19.5022	18.6486	17.9539	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9796	0.9572	0.9167	0.8274	0.6838	0.4994	0.3487	0.3983	0.6432	0.8768	0.9624	0.9834	(94)
Useful gains	1189.3593	1462.9757	1644.0741	1729.9280	1565.4512	1141.4600	761.8232	796.1422	1156.4351	1312.2603	1198.8303	1118.3039	(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	3011.4506	2961.9666	2720.8092	2308.8817	1788.2982	1192.0243	771.5310	812.1444	1285.1869	1925.6236	2506.7072	2996.1511	(97)
Space heating kWh	1355.6359	1007.3219	801.0909	416.8466	165.7982	0.0000	0.0000	0.0000	0.0000	456.3423	941.6714	1397.1183	(98a)
Space heating requirement - total per year (kWh/year)												6541.8254	
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	1355.6359	1007.3219	801.0909	416.8466	165.7982	0.0000	0.0000	0.0000	0.0000	456.3423	941.6714	1397.1183	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6541.8254	
Space heating per m2											(98c) / (4) =	28.6922	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1355.6359	1007.3219	801.0909	416.8466	165.7982	0.0000	0.0000	0.0000	0.0000	456.3423	941.6714	1397.1183	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	1468.7279	1091.3563	867.9208	451.6215	179.6297	0.0000	0.0000	0.0000	0.0000	494.4120	1020.2290	1513.6710	(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	255.1087	225.4068	239.3093	210.4320	203.9119	183.6929	181.4298	188.7770	190.9690	212.9655	226.4067	252.3624	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2417	87.0057	86.5546	85.5628	83.5997	79.8000	79.8000	79.8000	79.8000	85.7237	86.9003	87.2937	(217)
Fuel for water heating, kWh/month	292.4161	259.0712	276.4835	245.9388	243.9145	230.1916	227.3556	236.5627	239.3096	248.4324	260.5361	289.0956	(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	41.5994	33.3725	30.0483	22.0147	17.0048	13.8930	15.5123	20.1635	26.1904	34.3632	38.8131	42.7555	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-74.8014	-103.5784	-146.1985	-161.1976	-171.0032	-158.3815	-156.1641	-148.6305	-135.1745	-116.6541	-81.4577	-64.8701	(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	-48.1911	-100.6294	-198.7383	-296.7729	-390.9017	-392.4344	-388.0625	-329.4791	-242.5386	-143.6347	-64.2282	-38.1879	(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	7087.5681 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3049.3077 (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)	335.7306 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-4151.9105 (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	6406.6960 (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	7087.5681	0.2100	1488.3893	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3049.3077	0.2100	640.3546	(264)
Space and water heating			2128.7439	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	335.7306	0.1443	48.4563	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1518.1116	0.1350	-204.9740	
PV Unit electricity exported	-2633.7988	0.1261	-331.9966	
Total			-536.9706	(269)
Total CO2, kg/year			1652.1589	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.2500	(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	7087.5681	1.1300	8008.9520	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3049.3077	1.1300	3445.7177	(278)
Space and water heating			11454.6697	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	335.7306	1.5338	514.9549	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1518.1116	1.4990	-2275.6980	
PV Unit electricity exported	-2633.7988	0.4627	-1218.6712	
Total			-3494.3692	(283)
Total Primary energy kWh/year			8605.3562	(286)
Target Primary Energy Rate (TPER)			37.7400	(287)

Full SAP Calculation Printout

Property Reference	House Type R	Issued on Date	05/10/2023
Assessment Reference	Plot 51	Prop Type Ref	
Property			

SAP Rating	85 B	DER	2.75	TER	7.25
Environmental	97 A	% DER < TER			62.07
CO_2 Emissions (t/year)	0.57	DFEE	30.32	TFEE	33.52
Compliance Check	See BREL	% DFEE < TFEE			9.54
% DPER < TPER	23.94	DPER	28.70	TPER	37.74

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	84.0000	(1b)	x 2.4000	(2b) =	201.6000	(1b) -
First floor	72.0000	(1c)	x 2.4000	(2c) =	172.8000	(1c) -
Second floor	72.0000	(1d)	x 2.4000	(2d) =	172.8000	(1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	228.0000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	547.2000	(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	1 * 10 =	10.0000 (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) =	10.0000 / (5) =	0.0183 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2183 (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) =	0.1855 (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	0.2366	0.2319	0.2273	0.2041	0.1994	0.1763	0.1763	0.1716	0.1855	0.1994	0.2087	0.2180	(22b)
Effective ac	0.5280	0.5269	0.5258	0.5208	0.5199	0.5155	0.5155	0.5147	0.5172	0.5199	0.5218	0.5238	(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	
Opening Type 1 (Uw = 1.20)			52.4000	1.1450	60.0000			(27)
Heatloss Floor 1			72.0000	0.1200	8.6400	110.0000	7920.0000	(28a)
External Wall 1	177.0000	52.4000	124.6000	0.1900	23.6740	190.0000	23674.0000	(29a)
External Roof 1	72.0000		72.0000	0.1500	10.8000	9.0000	648.0000	(30)
External Roof 2	12.0000		12.0000	0.1500	1.8000	9.0000	108.0000	(30)
Total net area of external elements Aum(A, m2)			333.0000					(31)

Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 104.9140 (33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 32350.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 141.8860 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E5 Ground floor (normal)	46.0000	0.0670	3.0820
	E6 Intermediate floor within a dwelling	66.0000	0.0020	0.1320
	E16 Corner (normal)	28.8000	0.0410	1.1808
	E2 Other lintels (including other steel lintels)	25.0000	0.0240	0.6000
	E3 Sill	20.0000	0.0190	0.3800
	E4 Jamb	60.0000	0.0140	0.8400
	E10 Eaves (insulation at ceiling level)	20.0000	0.0460	0.9200
	E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5308 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 112.4448 (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	95.3404	95.1442	94.9519	94.0486	93.8796	93.0929	93.0929	92.9472	93.3960	93.8796	94.2215	94.5789	(38)
Heat transfer coeff	207.7852	207.5890	207.3967	206.4934	206.3244	205.5377	205.5377	205.3920	205.8408	206.3244	206.6663	207.0237	(39)

Average = Sum(39)m / 12 = 206.4926

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9113	0.9105	0.9096	0.9057	0.9049	0.9015	0.9015	0.9008	0.9028	0.9049	0.9064	0.9080	(40)
HLP (average)												0.9057	
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 3.0383 (42)
Hot water usage for mixer showers

75.1627	74.0331	72.3871	69.2379	66.9138	64.3220	62.8488	64.4823	66.2730	69.0558	72.2727	74.8747	(42a)

Hot water usage for baths

32.4456	31.9638	31.2852	30.0341	29.0972	28.0584	27.4973	28.1711	28.9048	30.0163	31.2932	32.3359	(42b)

Hot water usage for other uses

45.7455	44.0821	42.4186	40.7551	39.0916	37.4282	37.4282	39.0916	40.7551	42.4186	44.0821	45.7455	(42c)

Average daily hot water use (litres/day) 140.9665 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	153.3538	150.0790	146.0909	140.0270	135.1026	129.8085	127.7743	131.7451	135.9328	141.4907	147.6480	152.9562	(44)
Energy conte	242.8750	213.7104	224.5363	191.6900	181.8741	159.6148	154.5319	163.1279	167.6188	192.0015	210.3516	239.4924	(45)

Energy content (annual) Total = Sum(45)m = 2341.4248

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

36.4312	32.0566	33.6805	28.7535	27.2811	23.9422	23.1798	24.4692	25.1428	28.8002	31.5527	35.9239	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

296.2694	261.9376	277.9307	243.3620	235.2685	211.2868	207.9263	216.5223	219.2908	245.3959	262.0236	292.8868	(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

296.2694	261.9376	277.9307	243.3620	235.2685	211.2868	207.9263	216.5223	219.2908	245.3959	262.0236	292.8868	(64)

Total per year (kWh/year) = Sum(64)m = 2970.1008 (64)
12Total per year (kWh/year) 2970 (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

123.4715	109.6405	117.3739	105.0745	103.1887	94.4095	94.0974	96.9555	97.0708	106.5560	111.2795	122.3467	(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	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	200.2084	221.6593	200.2084	206.8820	200.2084	206.8820	200.2084	200.2084	206.8820	200.2084	206.8820	200.2084	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	396.9356	401.0546	390.6749	368.5780	340.6845	314.4686	296.9547	292.8358	303.2154	325.3124	353.2058	379.4218	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	(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)													

	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332 (71)
Water heating gains (Table 5)												
	165.9563	163.1555	157.7606	145.9369	138.6944	131.1243	126.4750	130.3166	134.8206	143.2205	154.5549	164.4445 (72)
Total internal gains												
	831.6752	854.4443	817.2189	789.9718	748.1623	721.0499	692.2130	691.9357	713.4930	737.3162	783.2177	812.6497 (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	23.4000	10.6334	0.7600	0.7000	0.7700	91.7345 (74)
East	8.5000	19.6403	0.7600	0.7000	0.7700	61.5476 (76)
South	16.5000	46.7521	0.7600	0.7000	0.7700	284.4000 (78)
West	4.0000	19.6403	0.7600	0.7000	0.7700	28.9636 (80)

Solar gains	466.6457	818.1423	1182.7977	1574.3341	1864.5344	1896.0373	1809.2246	1585.5178	1317.0826	921.1592	563.1341	396.6542 (83)
Total gains	1298.3209	1672.5866	2000.0166	2364.3059	2612.6967	2617.0871	2501.4377	2277.4535	2030.5756	1658.4754	1346.3518	1209.3038 (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	43.2471	43.2880	43.3281	43.5177	43.5533	43.7200	43.7200	43.7510	43.6556	43.5533	43.4813	43.4062	
alpha	3.8831	3.8859	3.8885	3.9012	3.9036	3.9147	3.9147	3.9167	3.9104	3.9036	3.8988	3.8937	
util living area													
	0.9861	0.9649	0.9206	0.8173	0.6595	0.4851	0.3572	0.4070	0.6366	0.8842	0.9716	0.9893	(86)
Living	19.3251	19.6776	20.1077	20.5662	20.8499	20.9648	20.9917	20.9863	20.9022	20.4793	19.8015	19.2530	
Non living	18.1771	18.6231	19.1590	19.7110	20.0262	20.1410	20.1621	20.1594	20.0873	19.6236	18.7864	18.0873	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	0	0	0	0	0	0	0	0	0	0	12	
16 / 9	0	28	31	0	0	0	0	0	0	0	19	19	
MIT	21.0000	20.2511	20.4946	20.5662	20.8499	20.9648	20.9917	20.9863	20.9022	20.4793	20.1307	20.3936	(87)
Th 2	20.1579	20.1586	20.1593	20.1627	20.1633	20.1662	20.1662	20.1668	20.1651	20.1633	20.1620	20.1607	(88)
util rest of house													
	0.9835	0.9587	0.9071	0.7894	0.6150	0.4273	0.2913	0.3364	0.5759	0.8588	0.9656	0.9872	(89)
MIT 2	20.1579	19.4809	19.7178	19.7110	20.0262	20.1410	20.1621	20.1594	20.0873	19.6236	19.2731	19.5998	(90)
Living area fraction										fLA = Living area / (4) =		0.0833	(91)
MIT	20.2281	19.5450	19.7825	19.7823	20.0948	20.2096	20.2312	20.2283	20.1553	19.6949	19.3446	19.6659	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2281	19.5450	19.7825	19.7823	20.0948	20.2096	20.2312	20.2283	20.1553	19.6949	19.3446	19.6659	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9534	0.9003	0.7753	0.6111	0.4304	0.2965	0.3417	0.5751	0.8421	0.9581	0.9858	(94)
Useful gains	1277.2582	1594.5811	1800.5367	1832.9435	1596.6987	1126.4557	741.7334	778.2719	1167.8804	1396.5606	1289.9757	1192.1743	(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													
	3309.6127	3040.1504	2754.7545	2247.1211	1732.0530	1152.9884	746.3467	786.3077	1246.4177	1876.5090	2530.5385	3201.8166	(97)
Space heating kWh													
	1512.0718	971.4226	709.9380	298.2079	100.7036	0.0000	0.0000	0.0000	0.0000	357.0816	893.2052	1495.1738	(98a)
Space heating requirement - total per year (kWh/year)												6337.8045	
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													
	1512.0718	971.4226	709.9380	298.2079	100.7036	0.0000	0.0000	0.0000	0.0000	357.0816	893.2052	1495.1738	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6337.8045	
Space heating per m2											(98c) / (4) =	27.7974	(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 %)	317.4990 (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													
	1512.0718	971.4226	709.9380	298.2079	100.7036	0.0000	0.0000	0.0000	0.0000	357.0816	893.2052	1495.1738	(98)
Space heating efficiency (main heating system 1)													
	317.4990	317.4990	317.4990	317.4990	317.4990	0.0000	0.0000	0.0000	0.0000	317.4990	317.4990	317.4990	(210)
Space heating fuel (main heating system)													
	476.2445	305.9608	223.6032	93.9240	31.7178	0.0000	0.0000	0.0000	0.0000	112.4670	281.3253	470.9223	(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												
	296.2694	261.9376	277.9307	243.3620	235.2685	211.2868	207.9263	216.5223	219.2908	245.3959	262.0236	292.8868 (64)
Efficiency of water heater												167.0527 (216)
(217)m	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527	167.0527 (217)
Fuel for water heating, kWh/month												
	177.3509	156.7994	166.3731	145.6798	140.8349	126.4791	124.4675	129.6132	131.2704	146.8973	156.8509	175.3260 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	55.3618	44.4133	39.9893	29.2979	22.6305	18.4893	20.6443	26.8343	34.8550	45.7317	51.6539	56.9005 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1996.1650 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	167.0527
Water heating fuel used	1777.9423 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	446.8018 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	4220.9091 (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	1996.1650	0.1568	312.9467	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1777.9423	0.1410	250.6393	(264)
Space and water heating			563.5860	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	446.8018	0.1443	64.4873	(268)
Total CO2, kg/year			628.0733	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.7500	(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	1996.1650	1.5803	3154.6318	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1777.9423	1.5213	2704.7219	(278)
Space and water heating			5859.3537	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	446.8018	1.5338	685.3196	(282)
Total Primary energy kWh/year			6544.6733	(286)
Dwelling Primary energy Rate (DPER)			28.7000	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	84.0000 (1b)	x	2.4000 (2b)	=	201.6000 (1b)	-
First floor	72.0000 (1c)	x	2.4000 (2c)	=	172.8000 (1c)	-
Second floor	72.0000 (1d)	x	2.4000 (2d)	=	172.8000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	228.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	547.2000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0731 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3231 (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) =	0.2746 (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	0.3502	0.3433	0.3364	0.3021	0.2952	0.2609	0.2609	0.2540	0.2746	0.2952	0.3090	0.3227	(22b)
Effective ac	0.5613	0.5589	0.5566	0.5456	0.5436	0.5340	0.5340	0.5323	0.5377	0.5436	0.5477	0.5521	(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 Opening Type (Uw = 1.20)			52.4000	1.1450	60.0000			(27)
Heatloss Floor 1			72.0000	0.1300	9.3600			(28a)
External Wall 1	177.0000	52.4000	124.6000	0.1800	22.4280			(29a)
External Roof 1	72.0000		72.0000	0.1100	7.9200			(30)
External Roof 2	12.0000		12.0000	0.1100	1.3200			(30)
Total net area of external elements Aum(A, m2)			333.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	101.0280			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 141.8860 (35)

List of Thermal Bridges

	Length	Psi-value	Total
E5 Ground floor (normal)	46.0000	0.1600	7.3600
E6 Intermediate floor within a dwelling	66.0000	0.0000	0.0000
E16 Corner (normal)	28.8000	0.0900	2.5920
E2 Other lintels (including other steel lintels)	25.0000	0.0500	1.2500
E3 Sill	20.0000	0.0500	1.0000
E4 Jamb	60.0000	0.0500	3.0000
E10 Eaves (insulation at ceiling level)	20.0000	0.0600	1.2000
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.1220 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 118.1500 (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	101.3583	100.9285	100.5071	98.5280	98.1577	96.4339	96.4339	96.1147	97.0979	98.1577	98.9068	99.6899	(38)
Heat transfer coeff	219.5083	219.0785	218.6571	216.6780	216.3077	214.5839	214.5839	214.2647	215.2479	216.3077	217.0568	217.8399	(39)

Average = Sum(39)m / 12 = 216.6762

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9628	0.9609	0.9590	0.9503	0.9487	0.9412	0.9412	0.9398	0.9441	0.9487	0.9520	0.9554	(40)
HLP (average)												0.9503	

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												3.0383	(42)
Hot water usage for mixer showers													
	75.1627	74.0331	72.3871	69.2379	66.9138	64.3220	62.8488	64.4823	66.2730	69.0558	72.2727	74.8747	(42a)
Hot water usage for baths													
	32.4456	31.9638	31.2852	30.0341	29.0972	28.0584	27.4973	28.1711	28.9048	30.0163	31.2932	32.3359	(42b)
Hot water usage for other uses													
	45.7455	44.0821	42.4186	40.7551	39.0916	37.4282	37.4282	39.0916	40.7551	42.4186	44.0821	45.7455	(42c)
Average daily hot water use (litres/day)												140.9665	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	153.3538	150.0790	146.0909	140.0270	135.1026	129.8085	127.7743	131.7451	135.9328	141.4907	147.6480	152.9562	(44)
Energy conte	242.8750	213.7104	224.5363	191.6900	181.8741	159.6148	154.5319	163.1279	167.6188	192.0015	210.3516	239.4924	(45)
Energy content (annual)											Total = Sum(45)m =	2341.4248	
Distribution loss (46)m = 0.15 x (45)m													
	36.4312	32.0566	33.6805	28.7535	27.2811	23.9422	23.1798	24.4692	25.1428	28.8002	31.5527	35.9239	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	289.4699	255.7961	271.1312	236.7819	228.4690	204.7066	201.1268	209.7228	212.7106	238.5964	255.4435	286.0873	(62)
WWHRS	-34.3612	-30.3894	-31.8220	-26.3499	-24.5571	-21.0137	-19.6970	-20.9458	-21.7416	-25.6309	-29.0367	-33.7249	(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													
	255.1087	225.4068	239.3093	210.4320	203.9119	183.6929	181.4298	188.7770	190.9690	212.9655	226.4067	252.3624	(64)
										Total per year (kWh/year) = Sum(64)m =		2570.7720	(64)
12Total per year (kWh/year)												2571	(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													
	118.0319	104.7273	111.9343	99.8104	97.7491	89.1454	88.6578	91.5160	91.8067	101.1164	106.0154	116.9071	(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	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	151.9165	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	200.2084	221.6593	200.2084	206.8820	200.2084	206.8820	200.2084	200.2084	206.8820	200.2084	206.8820	200.2084	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	396.9356	401.0546	390.6749	368.5780	340.6845	314.4686	296.9547	292.8358	303.2154	325.3124	353.2058	379.4218	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	38.1916	(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)													
	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	-121.5332	(71)
Water heating gains (Table 5)													
	158.6450	155.8442	150.4493	138.6256	131.3832	123.8130	119.1637	123.0053	127.5093	135.9092	147.2436	157.1333	(72)
Total internal gains													
	827.3640	850.1330	812.9076	785.6605	743.8510	713.7386	684.9018	684.6244	706.1817	733.0049	778.9064	808.3384	(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	23.4000	10.6334	0.6300	0.7000	0.7700	76.0430	(74)
East	8.5000	19.6403	0.6300	0.7000	0.7700	51.0197	(76)
South	16.5000	46.7521	0.6300	0.7000	0.7700	235.7526	(78)
West	4.0000	19.6403	0.6300	0.7000	0.7700	24.0093	(80)

Solar gains	386.8247	678.1969	980.4770	1305.0401	1545.6009	1571.7151	1499.7520	1314.3108	1091.7921	763.5925	466.8085	328.8054	(83)
Total gains	1214.1886	1528.3299	1793.3846	2090.7006	2289.4519	2285.4537	2184.6538	1998.9352	1797.9738	1496.5974	1245.7149	1137.1438	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)													
tau	40.9374	41.0178	41.0968	41.4722	41.5432	41.8769	41.8769	41.9393	41.7477	41.5432	41.3998	41.2510	
alpha	3.7292	3.7345	3.7398	3.7648	3.7695	3.7918	3.7918	3.7960	3.7832	3.7695	3.7600	3.7501	
util living area	0.9891	0.9746	0.9447	0.8691	0.7365	0.5628	0.4218	0.4754	0.7097	0.9159	0.9786	0.9914	(86)
MIT	19.1429	19.4639	19.8865	20.3914	20.7537	20.9340	20.9828	20.9732	20.8415	20.3352	19.6410	19.0879	(87)
Th 2	20.1145	20.1161	20.1176	20.1249	20.1263	20.1327	20.1327	20.1338	20.1302	20.1263	20.1235	20.1206	(88)
util rest of house	0.9870	0.9698	0.9343	0.8454	0.6925	0.4977	0.3429	0.3927	0.6478	0.8952	0.9738	0.9897	(89)
MIT 2	17.9169	18.3252	18.8575	19.4799	19.8959	20.0842	20.1239	20.1192	20.0007	19.4265	18.5584	17.8508	(90)
Living area fraction										fLA = Living area / (4) =		0.0833	(91)
MIT	18.0191	18.4201	18.9433	19.5558	19.9674	20.1550	20.1955	20.1904	20.0707	19.5022	18.6486	17.9539	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0191	18.4201	18.9433	19.5558	19.9674	20.1550	20.1955	20.1904	20.0707	19.5022	18.6486	17.9539	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9796	0.9572	0.9167	0.8274	0.6838	0.4994	0.3487	0.3983	0.6432	0.8768	0.9624	0.9834	(94)
Useful gains	1189.3593	1462.9757	1644.0741	1729.9280	1565.4512	1141.4600	761.8232	796.1422	1156.4351	1312.2603	1198.8303	1118.3039	(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	3011.4506	2961.9666	2720.8092	2308.8817	1788.2982	1192.0243	771.5310	812.1444	1285.1869	1925.6236	2506.7072	2996.1511	(97)
Space heating kWh	1355.6359	1007.3219	801.0909	416.8466	165.7982	0.0000	0.0000	0.0000	0.0000	456.3423	941.6714	1397.1183	(98a)
Space heating requirement - total per year (kWh/year)												6541.8254	
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	1355.6359	1007.3219	801.0909	416.8466	165.7982	0.0000	0.0000	0.0000	0.0000	456.3423	941.6714	1397.1183	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6541.8254	
Space heating per m2											(98c) / (4) =	28.6922	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1355.6359	1007.3219	801.0909	416.8466	165.7982	0.0000	0.0000	0.0000	0.0000	456.3423	941.6714	1397.1183	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	1468.7279	1091.3563	867.9208	451.6215	179.6297	0.0000	0.0000	0.0000	0.0000	494.4120	1020.2290	1513.6710	(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	255.1087	225.4068	239.3093	210.4320	203.9119	183.6929	181.4298	188.7770	190.9690	212.9655	226.4067	252.3624	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2417	87.0057	86.5546	85.5628	83.5997	79.8000	79.8000	79.8000	79.8000	85.7237	86.9003	87.2937	(217)
Fuel for water heating, kWh/month	292.4161	259.0712	276.4835	245.9388	243.9145	230.1916	227.3556	236.5627	239.3096	248.4324	260.5361	289.0956	(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	41.5994	33.3725	30.0483	22.0147	17.0048	13.8930	15.5123	20.1635	26.1904	34.3632	38.8131	42.7555	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-74.8014	-103.5784	-146.1985	-161.1976	-171.0032	-158.3815	-156.1641	-148.6305	-135.1745	-116.6541	-81.4577	-64.8701	(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	-48.1911	-100.6294	-198.7383	-296.7729	-390.9017	-392.4344	-388.0625	-329.4791	-242.5386	-143.6347	-64.2282	-38.1879	(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	7087.5681 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3049.3077 (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)	335.7306 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-4151.9105 (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	6406.6960 (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	7087.5681	0.2100	1488.3893	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3049.3077	0.2100	640.3546	(264)
Space and water heating			2128.7439	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	335.7306	0.1443	48.4563	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1518.1116	0.1350	-204.9740	
PV Unit electricity exported	-2633.7988	0.1261	-331.9966	
Total			-536.9706	(269)
Total CO2, kg/year			1652.1589	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.2500	(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	7087.5681	1.1300	8008.9520	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3049.3077	1.1300	3445.7177	(278)
Space and water heating			11454.6697	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	335.7306	1.5338	514.9549	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1518.1116	1.4990	-2275.6980	
PV Unit electricity exported	-2633.7988	0.4627	-1218.6712	
Total			-3494.3692	(283)
Total Primary energy kWh/year			8605.3562	(286)
Target Primary Energy Rate (TPER)			37.7400	(287)

Full SAP Calculation Printout

Property Reference	House Type K	Issued on Date	05/10/2023
Assessment Reference	Plot 52	Prop Type Ref	
Property			

SAP Rating	85 B	DER	2.87	TER	7.58
Environmental	97 A	% DER < TER			62.14
CO_2 Emissions (t/year)	0.48	DFEE	29.07	TFEE	32.07
Compliance Check	See BREL	% DFEE < TFEE			9.35
% DPER < TPER	23.75	DPER	30.02	TPER	39.37

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	65.0000 (1b)	x	2.4000 (2b)	=	156.0000 (1b)	-
First floor	72.0000 (1c)	x	2.4000 (2c)	=	172.8000 (1c)	-
Second floor	45.0000 (1d)	x	2.4000 (2d)	=	108.0000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	182.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	436.8000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0229	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2229	(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) =	0.1895	(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	0.2416	0.2368	0.2321	0.2084	0.2037	0.1800	0.1800	0.1753	0.1895	0.2037	0.2131	0.2226	(22b)
Effective ac	0.5292	0.5280	0.5269	0.5217	0.5207	0.5162	0.5162	0.5154	0.5179	0.5207	0.5227	0.5248	(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	
Opening Type 1 (Uw = 1.20)			54.4000	1.1450	62.2901			(27)
Heatloss Floor 1			65.0000	0.1200	7.8000	110.0000	7150.0000	(28a)
External Wall 1	163.0000	54.4000	108.6000	0.1900	20.6340	190.0000	20634.0000	(29a)
External Roof 1	46.0000		46.0000	0.1500	6.9000	9.0000	414.0000	(30)
Total net area of external elements Aum(A, m2)			274.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		97.6241			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 28198.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 154.9341 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	30.0000	0.0670	2.0100
E6 Intermediate floor within a dwelling	38.0000	0.0020	0.0760
E16 Corner (normal)	28.8000	0.0410	1.1808
E2 Other lintels (including other steel lintels)	21.2500	0.0240	0.5100
E3 Sill	15.3500	0.0190	0.2916
E4 Jamb	72.4000	0.0140	1.0136
E10 Eaves (insulation at ceiling level)	18.0000	0.0460	0.8280
E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3061 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 103.9301 (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	76.2775	76.1142	75.9542	75.2023	75.0616	74.4068	74.4068	74.2855	74.6590	75.0616	75.3462	75.6437	(38)
Heat transfer coeff	180.2077	180.0443	179.8843	179.1324	178.9918	178.3369	178.3369	178.2156	178.5891	178.9918	179.2763	179.5738	(39)

Average = Sum(39)m / 12 = 179.1318

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9902	0.9893	0.9884	0.9842	0.9835	0.9799	0.9799	0.9792	0.9813	0.9835	0.9850	0.9867	(40)
HLP (average)												0.9842	
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 2.9784 (42)
Hot water usage for mixer showers

74.1585	73.0440	71.4200	68.3128	66.0198	63.4626	62.0091	63.6208	65.3875	68.1332	71.3071	73.8743	(42a)

Hot water usage for baths

32.0138	31.5383	30.8688	29.6343	28.7099	27.6849	27.1313	27.7961	28.5200	29.6168	30.8767	31.9056	(42b)

Hot water usage for other uses

45.1322	43.4910	41.8498	40.2087	38.5675	36.9263	36.9263	38.5675	40.2087	41.8498	43.4910	45.1322	(42c)

Average daily hot water use (litres/day) 139.0827 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.3045	148.0734	144.1387	138.1558	133.2972	128.0739	126.0668	129.9845	134.1163	139.5998	145.6749	150.9121	(44)
Energy conte	239.6293	210.8545	221.5358	189.1284	179.4437	157.4818	152.4668	160.9479	165.3788	189.4356	207.5405	236.2919	(45)

Energy content (annual) Total = Sum(45)m = 2310.1351
Distribution loss (46)m = 0.15 x (45)m

35.9444	31.6282	33.2304	28.3693	26.9166	23.6223	22.8700	24.1422	24.8068	28.4153	31.1311	35.4438	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

293.0237	259.0817	274.9302	240.8004	232.8381	209.1538	205.8612	214.3423	217.0508	242.8300	259.2125	289.6863	(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

293.0237	259.0817	274.9302	240.8004	232.8381	209.1538	205.8612	214.3423	217.0508	242.8300	259.2125	289.6863	(64)

Total per year (kWh/year) = Sum(64)m = 2938.8111 (64)
12Total per year (kWh/year) 2939 (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

122.3923	108.6909	116.3762	104.2228	102.3806	93.7003	93.4107	96.2307	96.3260	105.7029	110.3448	121.2826	(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	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	178.3502	197.4592	178.3502	184.2952	178.3502	184.2952	178.3502	178.3502	184.2952	178.3502	184.2952	178.3502	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	353.5993	357.2685	348.0221	328.3376	303.4895	280.1357	264.5340	260.8647	270.1111	289.7956	314.6438	337.9975	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	(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)	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	(71)

Water heating gains (Table 5)

	164.5057	161.7424	156.4196	144.7539	137.6083	130.1393	125.5521	129.3423	133.7862	142.0738	153.2567	163.0142 (72)

Total internal gains

	764.1318	784.1467	750.4685	725.0633	687.1245	662.2468	636.1129	636.2339	655.8691	677.8962	719.8723	747.0385 (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	17.2500	10.6334	0.7600	0.7000	0.7700	67.6248 (74)
East	5.1500	19.6403	0.7600	0.7000	0.7700	37.2906 (76)
South	26.7500	46.7521	0.7600	0.7000	0.7700	461.0727 (78)
West	5.2500	19.6403	0.7600	0.7000	0.7700	38.0147 (80)

Solar gains	604.0028	1031.6659	1424.0914	1793.6993	2041.6582	2042.8022	1962.7424	1774.2742	1550.9939	1143.1021	723.8491	516.7120 (83)
Total gains	1368.1346	1815.8125	2174.5599	2518.7626	2728.7828	2705.0491	2598.8552	2410.5081	2206.8630	1820.9983	1443.7214	1263.7506 (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	43.4653	43.5047	43.5434	43.7262	43.7606	43.9212	43.9212	43.9511	43.8592	43.7606	43.6911	43.6187	
alpha	3.8977	3.9003	3.9029	3.9151	3.9174	3.9281	3.9281	3.9301	3.9239	3.9174	3.9127	3.9079	
util living area	0.9742	0.9330	0.8614	0.7329	0.5724	0.4136	0.3000	0.3368	0.5318	0.8053	0.9466	0.9803	(86)
Living	19.5267	19.9412	20.3537	20.7169	20.9096	20.9801	20.9956	20.9931	20.9484	20.6522	20.0098	19.4362	
Non living	18.3780	18.8944	19.3950	19.8157	20.0192	20.0869	20.0982	20.0974	20.0613	19.7574	18.9899	18.2658	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	21	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	10	28	30	0	0	0	0	0	0	0	0	31	
MIT	20.7308	20.4003	20.6249	20.7169	20.9096	20.9801	20.9956	20.9931	20.9484	20.6522	20.0098	20.1143	(87)
Th 2	20.0915	20.0923	20.0930	20.0965	20.0971	20.1001	20.1001	20.1007	20.0990	20.0971	20.0958	20.0945	(88)
util rest of house	0.9693	0.9214	0.8399	0.6976	0.5255	0.3583	0.2395	0.2724	0.4704	0.7684	0.9354	0.9765	(89)
MIT 2	19.8476	19.5636	19.7723	19.8157	20.0192	20.0869	20.0982	20.0974	20.0613	19.7574	18.9899	19.2873	(90)
Living area fraction									fLA = Living area / (4) =			0.0934	(91)
MIT	19.9301	19.6417	19.8520	19.8999	20.1024	20.1703	20.1820	20.1810	20.1442	19.8410	19.0852	19.3646	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9301	19.6417	19.8520	19.8999	20.1024	20.1703	20.1820	20.1810	20.1442	19.8410	19.0852	19.3646	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9683	0.9149	0.8336	0.6894	0.5258	0.3627	0.2451	0.2782	0.4736	0.7567	0.9193	0.9727	(94)
Useful gains	1324.7020	1661.2677	1812.6756	1736.3553	1434.8364	981.0206	636.8534	670.5924	1045.0853	1377.9038	1327.2534	1229.2385	(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	2816.6582	2654.1630	2401.8103	1970.4327	1503.9612	993.3963	638.8008	673.8393	1079.4281	1654.0622	2148.6567	2723.1611	(97)
Space heating kWh	1110.0154	667.2256	438.3162	168.5357	51.4288	0.0000	0.0000	0.0000	0.0000	205.4619	591.4104	1111.4784	(98a)
Space heating requirement - total per year (kWh/year)												4343.8724	
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	1110.0154	667.2256	438.3162	168.5357	51.4288	0.0000	0.0000	0.0000	0.0000	205.4619	591.4104	1111.4784	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4343.8724	
Space heating per m2											(98c) / (4) =	23.8674	(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 %)	312.6509 (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	1110.0154	667.2256	438.3162	168.5357	51.4288	0.0000	0.0000	0.0000	0.0000	205.4619	591.4104	1111.4784	(98)
Space heating efficiency (main heating system 1)	312.6509	312.6509	312.6509	312.6509	312.6509	0.0000	0.0000	0.0000	0.0000	312.6509	312.6509	312.6509	(210)
Space heating fuel (main heating system)	355.0334	213.4091	140.1935	53.9054	16.4493	0.0000	0.0000	0.0000	0.0000	65.7161	189.1600	355.5014	(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

293.0237	259.0817	274.9302	240.8004	232.8381	209.1538	205.8612	214.3423	217.0508	242.8300	259.2125	289.6863 (64)

Efficiency of water heater 168.2132 (216)

(217)m 168.2132	168.2132	168.2132	168.2132	168.2132	168.2132	168.2132	168.2132	168.2132	168.2132	168.2132	168.2132 (217)

Fuel for water heating, kWh/month

174.1978	154.0199	163.4415	143.1519	138.4185	124.3385	122.3812	127.4230	129.0332	144.3585	154.0977	172.2138 (219)

Space cooling fuel requirement

(221)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting 48.9927	39.3037	35.3887	25.9273	20.0270	16.3622	18.2693	23.7471	30.8451	40.4704	45.7113	50.3543 (232)

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

(233a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)

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

(233b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	1389.3681 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	168.2132
Water heating fuel used	1747.0755 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	395.3989 (232)

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

PV generation	0.0000 (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	3531.8425 (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	1389.3681	0.1575	218.7925	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1747.0755	0.1410	246.2767	(264)
Space and water heating			465.0692	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	395.3989	0.1443	57.0683	(268)
Total CO2, kg/year			522.1375	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.8700	(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	1389.3681	1.5829	2199.2553	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1747.0755	1.5212	2657.7230	(278)
Space and water heating			4856.9783	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	395.3989	1.5338	606.4761	(282)
Total Primary energy kWh/year			5463.4544	(286)
Dwelling Primary energy Rate (DPER)			30.0200	(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	65.0000 (1b)	x	2.4000 (2b)	=	156.0000 (1b)	-
First floor	72.0000 (1c)	x	2.4000 (2c)	=	172.8000 (1c)	-
Second floor	45.0000 (1d)	x	2.4000 (2d)	=	108.0000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	182.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	436.8000	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0916	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3416	(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) =	0.2903	(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	0.3702	0.3629	0.3557	0.3194	0.3121	0.2758	0.2758	0.2686	0.2903	0.3121	0.3266	0.3411	(22b)
Effective ac	0.5685	0.5659	0.5632	0.5510	0.5487	0.5380	0.5380	0.5361	0.5421	0.5487	0.5533	0.5582	(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 Opening Type (Uw = 1.20)			45.5000	1.1450	52.0992			(27)
Heatloss Floor 1			65.0000	0.1300	8.4500			(28a)
External Wall 1	163.0000	45.5000	117.5000	0.1800	21.1500			(29a)
External Roof 1	46.0000		46.0000	0.1100	5.0600			(30)
Total net area of external elements Aum(A, m2)			274.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		86.7592			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 154.9341 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	30.0000	0.1600	4.8000
E6 Intermediate floor within a dwelling	38.0000	0.0000	0.0000
E16 Corner (normal)	28.8000	0.0900	2.5920
E2 Other lintels (including other steel lintels)	21.2500	0.0500	1.0625
E3 Sill	15.3500	0.0500	0.7675
E4 Jamb	72.4000	0.0500	3.6200
E10 Eaves (insulation at ceiling level)	18.0000	0.0600	1.0800
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.6420	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	101.4012	(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	81.9484	81.5649	81.1889	79.4233	79.0929	77.5551	77.5551	77.2703	78.1474	79.0929	79.7612	80.4599	(38)
Heat transfer coeff	183.3496	182.9661	182.5902	180.8245	180.4942	178.9563	178.9563	178.6715	179.5487	180.4942	181.1624	181.8611	(39)
Average = Sum(39)m / 12 =												180.8229	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0074	1.0053	1.0032	0.9935	0.9917	0.9833	0.9833	0.9817	0.9865	0.9917	0.9954	0.9992	(40)
HLP (average)												0.9935	
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 2.9784 (42)

Hot water usage for mixer showers

74.1585	73.0440	71.4200	68.3128	66.0198	63.4626	62.0091	63.6208	65.3875	68.1332	71.3071	73.8743 (42a)

Hot water usage for baths

32.0138	31.5383	30.8688	29.6343	28.7099	27.6849	27.1313	27.7961	28.5200	29.6168	30.8767	31.9056 (42b)

Hot water usage for other uses

45.1322	43.4910	41.8498	40.2087	38.5675	36.9263	36.9263	38.5675	40.2087	41.8498	43.4910	45.1322 (42c)

Average daily hot water use (litres/day) 139.0827 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.3045	148.0734	144.1387	138.1558	133.2972	128.0739	126.0668	129.9845	134.1163	139.5998	145.6749	150.9121	(44)
Energy conte	239.6293	210.8545	221.5358	189.1284	179.4437	157.4818	152.4668	160.9479	165.3788	189.4356	207.5405	236.2919	(45)
Energy content (annual)										Total = Sum(45)m =		2310.1351	
Distribution loss (46)m = 0.15 x (45)m													
	35.9444	31.6282	33.2304	28.3693	26.9166	23.6223	22.8700	24.1422	24.8068	28.4153	31.1311	35.4438	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	286.2242	252.9402	268.1307	234.2203	226.0386	202.5737	199.0617	207.5428	210.4706	236.0305	252.6324	282.8868	(62)
WWHRS	-33.9022	-29.9833	-31.3968	-25.9978	-24.2290	-20.7330	-19.4338	-20.6659	-21.4511	-25.2885	-28.6488	-33.2743	(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													
	252.3220	222.9569	236.7339	208.2224	201.8096	181.8407	179.6279	186.8769	189.0195	210.7421	223.9836	249.6124	(64)
										Total per year (kWh/year) = Sum(64)m =		2543.7478	(64)
12Total per year (kWh/year)												2544	(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													
	116.9527	103.7777	110.9366	98.9587	96.9410	88.4362	87.9711	90.7911	91.0619	100.2633	105.0807	115.8430	(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	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	148.9219	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	178.3502	197.4592	178.3502	184.2952	178.3502	184.2952	178.3502	178.3502	184.2952	178.3502	184.2952	178.3502	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	353.5993	357.2685	348.0221	328.3376	303.4895	280.1357	264.5340	260.8647	270.1111	289.7956	314.6438	337.9975	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	37.8922	(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)													
	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	-119.1375	(71)
Water heating gains (Table 5)													
	157.1944	154.4311	149.1083	137.4426	130.2970	122.8280	118.2408	122.0311	126.4749	134.7625	145.9454	155.7029	(72)
Total internal gains													
	759.8205	779.8354	746.1572	720.7520	682.8133	654.9356	628.8016	628.9226	648.5578	673.5849	715.5610	742.7272	(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	14.4300	10.6334	0.6300	0.7000	0.7700	46.8932	(74)
East	4.3100	19.6403	0.6300	0.7000	0.7700	25.8700	(76)
South	22.3700	46.7521	0.6300	0.7000	0.7700	319.6234	(78)
West	4.3900	19.6403	0.6300	0.7000	0.7700	26.3502	(80)

Solar gains	418.7368	715.2299	987.3073	1243.5799	1415.5140	1416.3166	1360.8056	1230.1214	1075.2969	792.4910	501.8240	358.2199	(83)
Total gains	1178.5573	1495.0653	1733.4645	1964.3319	2098.3272	2071.2521	1989.6071	1859.0440	1723.8547	1466.0759	1217.3850	1100.9471	(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	42.7205	42.8100	42.8981	43.3170	43.3963	43.7692	43.7692	43.8390	43.6248	43.3963	43.2362	43.0701	
alpha	3.8480	3.8540	3.8599	3.8878	3.8931	3.9179	3.9179	3.9226	3.9083	3.8931	3.8824	3.8713	
util living area													
	0.9842	0.9625	0.9228	0.8359	0.6990	0.5273	0.3894	0.4319	0.6494	0.8808	0.9684	0.9876	(86)
MIT	19.3365	19.6814	20.0824	20.5207	20.8138	20.9532	20.9888	20.9833	20.8949	20.4854	19.8248	19.2749	(87)
Th 2	20.0772	20.0789	20.0806	20.0887	20.0902	20.0973	20.0973	20.0986	20.0946	20.0902	20.0872	20.0840	(88)
util rest of house													
	0.9810	0.9553	0.9083	0.8070	0.6509	0.4611	0.3122	0.3515	0.5831	0.8525	0.9611	0.9851	(89)
MIT 2	18.1282	18.5641	19.0637	19.5953	19.9229	20.0649	20.0921	20.0902	20.0142	19.5682	18.7554	18.0546	(90)
Living area fraction										fLA = Living area / (4) =		0.0934	(91)
MIT	18.2411	18.6685	19.1588	19.6817	20.0061	20.1479	20.1758	20.1736	20.0965	19.6539	18.8552	18.1686	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2411	18.6685	19.1588	19.6817	20.0061	20.1479	20.1758	20.1736	20.0965	19.6539	18.8552	18.1686	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9719	0.9409	0.8906	0.7924	0.6462	0.4650	0.3191	0.3583	0.5832	0.8364	0.9477	0.9774	(94)
Useful gains	1145.4921	1406.6769	1543.8776	1556.5443	1355.9194	963.0391	634.7976	666.1448	1005.3647	1226.2318	1153.7673	1076.0170	(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													
	2556.0917	2519.1671	2311.3767	1949.5980	1499.1986	992.8262	639.9153	674.2419	1076.6578	1634.1760	2129.6093	2540.3494	(97)
Space heating kWh													
	1049.4861	747.5934	571.0194	282.9987	106.5997	0.0000	0.0000	0.0000	0.0000	303.5105	702.6062	1089.4633	(98a)
Space heating requirement - total per year (kWh/year)												4853.2773	
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													
	1049.4861	747.5934	571.0194	282.9987	106.5997	0.0000	0.0000	0.0000	0.0000	303.5105	702.6062	1089.4633	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4853.2773	
Space heating per m2											(98c) / (4) =	26.6664	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1049.4861	747.5934	571.0194	282.9987	106.5997	0.0000	0.0000	0.0000	0.0000	303.5105	702.6062	1089.4633	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	1137.0380	809.9604	618.6559	306.6074	115.4927	0.0000	0.0000	0.0000	0.0000	328.8304	761.2202	1180.3502	(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													
	252.3220	222.9569	236.7339	208.2224	201.8096	181.8407	179.6279	186.8769	189.0195	210.7421	223.9836	249.6124	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.9004	86.5574	85.9587	84.7484	82.6970	79.8000	79.8000	79.8000	79.8000	84.8771	86.4433	86.9716	(217)
Fuel for water heating, kWh/month													
	290.3578	257.5826	275.4041	245.6947	244.0349	227.8705	225.0976	234.1816	236.8665	248.2908	259.1103	287.0046	(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	37.0577	29.7290	26.7677	19.6112	15.1482	12.3762	13.8187	17.9621	23.3310	30.6115	34.5756	38.0876	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-60.0003	-84.1803	-120.3819	-134.5579	-144.3054	-134.2544	-132.4248	-125.2984	-112.7632	-95.7038	-65.7496	-51.9075	(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	-35.1725	-73.8376	-146.5335	-219.8240	-290.5020	-291.9722	-288.7029	-244.6674	-179.5148	-105.7101	-46.9836	-27.8397	(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												5258.1552	(211)

Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3031.4961 (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)	299.0765 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3212.7879 (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	5461.9399 (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	5258.1552	0.2100	1104.2126	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3031.4961	0.2100	636.6142	(264)
Space and water heating			1740.8268	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	299.0765	0.1443	43.1660	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1261.5274	0.1347	-169.9624	
PV Unit electricity exported	-1951.2605	0.1259	-245.6972	
Total			-415.6597	(269)
Total CO2, kg/year			1380.2623	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.5800	(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	5258.1552	1.1300	5941.7154	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3031.4961	1.1300	3425.5906	(278)
Space and water heating			9367.3060	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	299.0765	1.5338	458.7335	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1261.5274	1.4979	-1889.6902	
PV Unit electricity exported	-1951.2605	0.4622	-901.8773	
Total			-2791.5675	(283)
Total Primary energy kWh/year			7164.5728	(286)
Target Primary Energy Rate (TPER)			39.3700	(287)

Full SAP Calculation Printout

Property Reference	House Type P	Issued on Date	05/10/2023
Assessment Reference	Plot 53	Prop Type Ref	
Property			

SAP Rating	84 B	DER	3.24	TER	8.98
Environmental	97 A	% DER < TER			63.92
CO_2 Emissions (t/year)	0.54	DFEE	36.46	TFEE	40.39
Compliance Check	See BREL	% DFEE < TFEE			9.73
% DPER < TPER	28.20	DPER	33.76	TPER	47.01

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	80.0000	(1b)	x 2.4000	(2b) =	192.0000	(1b) -
First floor	64.0000	(1c)	x 2.4000	(2c) =	153.6000	(1c) -
Second floor	40.0000	(1d)	x 2.4000	(2d) =	96.0000	(1d) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	184.0000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	441.6000	(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	1 * 10 =	10.0000 (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) =	10.0000 / (5) =	0.0226 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		4.0000 (17)
Infiltration rate		0.2226 (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) =	0.1892 (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	0.2413	0.2366	0.2318	0.2082	0.2034	0.1798	0.1798	0.1751	0.1892	0.2034	0.2129	0.2224	(22b)
Effective ac	0.5291	0.5280	0.5269	0.5217	0.5207	0.5162	0.5162	0.5153	0.5179	0.5207	0.5227	0.5247	(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	
Opening Type 1 (Uw = 1.20)			56.3300	1.1450	64.5000			(27)
Heatloss Floor 1			80.0000	0.1200	9.6000	110.0000	8800.0000	(28a)
External Wall 1	274.0000	56.3300	217.6700	0.1900	41.3573	190.0000	41357.3000	(29a)
External Roof 1	64.0000		64.0000	0.1500	9.6000	9.0000	576.0000	(30)
External Roof 2	16.0000		16.0000	0.1500	2.4000	9.0000	144.0000	(30)
Total net area of external elements Aum(A, m2)			434.0000					(31)

Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 127.4573 (33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 50877.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 276.5071 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E5 Ground floor (normal)	46.0000	0.0670	3.0820
	E6 Intermediate floor within a dwelling	66.0000	0.0020	0.1320
	E16 Corner (normal)	28.8000	0.0410	1.1808
	E2 Other lintels (including other steel lintels)	25.0000	0.0240	0.6000
	E3 Sill	20.0000	0.0190	0.3800
	E4 Jamb	60.0000	0.0140	0.8400
	E10 Eaves (insulation at ceiling level)	20.0000	0.0460	0.9200
	E12 Gable (insulation at ceiling level)	12.0000	0.0330	0.3960

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5308 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 134.9881 (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	77.1063	76.9415	76.7801	76.0216	75.8797	75.2192	75.2192	75.0969	75.4736	75.8797	76.1668	76.4669	(38)
Heat transfer coeff	212.0944	211.9296	211.7682	211.0097	210.8678	210.2073	210.2073	210.0850	210.4617	210.8678	211.1549	211.4550	(39)

Average = Sum(39)m / 12 = 211.0091

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1527	1.1518	1.1509	1.1468	1.1460	1.1424	1.1424	1.1418	1.1438	1.1460	1.1476	1.1492	(40)
HLP (average)												1.1468	
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 2.9811 (42)
Hot water usage for mixer showers

74.2024	73.0873	71.4623	68.3533	66.0589	63.5002	62.0459	63.6585	65.4263	68.1735	71.3493	73.9181	(42a)

Hot water usage for baths

32.0327	31.5569	30.8870	29.6518	28.7269	27.7013	27.1473	27.8125	28.5369	29.6343	30.8950	31.9244	(42b)

Hot water usage for other uses

45.1590	43.5169	41.8747	40.2326	38.5904	36.9483	36.9483	38.5904	40.2326	41.8747	43.5169	45.1590	(42c)

Average daily hot water use (litres/day) 139.1651 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.3941	148.1611	144.2241	138.2377	133.3762	128.1498	126.1414	130.0615	134.1957	139.6825	145.7612	151.0015	(44)
Energy conte	239.7712	210.9794	221.6670	189.2404	179.5500	157.5751	152.5571	161.0433	165.4767	189.5479	207.6635	236.4318	(45)

Energy content (annual) Total = Sum(45)m = 2311.5035
Distribution loss (46)m = 0.15 x (45)m

35.9657	31.6469	33.2501	28.3861	26.9325	23.6363	22.8836	24.1565	24.8215	28.4322	31.1495	35.4648	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)

If cylinder contains dedicated solar storage

30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

293.1656	259.2066	275.0614	240.9124	232.9444	209.2471	205.9515	214.4377	217.1487	242.9423	259.3355	289.8262	(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

293.1656	259.2066	275.0614	240.9124	232.9444	209.2471	205.9515	214.4377	217.1487	242.9423	259.3355	289.8262	(64)

Total per year (kWh/year) = Sum(64)m = 2940.1795 (64)
12Total per year (kWh/year) 2940 (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

122.4394	108.7324	116.4198	104.2600	102.4159	93.7313	93.4408	96.2624	96.3586	105.7402	110.3857	121.3291	(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	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	179.3457	198.5614	179.3457	185.3239	179.3457	185.3239	179.3457	179.3457	185.3239	179.3457	185.3239	179.3457	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	355.5730	359.2627	349.9647	330.1704	305.1835	281.6994	266.0106	262.3209	271.6189	291.4132	316.4001	339.8842	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	(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)													

	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	(71)
Water heating gains (Table 5)												
	164.5692	161.8042	156.4782	144.8056	137.6558	130.1824	125.5924	129.3850	133.8314	142.1239	153.3135	163.0768 (72)
Total internal gains												
	767.2038	787.3442	753.5046	728.0158	689.9009	664.9216	638.6646	638.7674	658.4901	680.5988	722.7534	750.0225 (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	10.6500	10.6334	0.7600	0.7000	0.7700	41.7509	(74)
East	19.0700	19.6403	0.7600	0.7000	0.7700	138.0838	(76)
South	21.8600	46.7521	0.7600	0.7000	0.7700	376.7869	(78)
West	4.7500	19.6403	0.7600	0.7000	0.7700	34.3942	(80)

Solar gains	591.0160	1034.2718	1477.2859	1916.5742	2212.3039	2221.6683	2131.6274	1909.4270	1630.3838	1160.9139	713.1861	502.2218	(83)
Total gains	1358.2197	1821.6160	2230.7904	2644.5899	2902.2048	2886.5899	2770.2920	2548.1945	2288.8739	1841.5127	1435.9394	1252.2444	(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	66.6335	66.6853	66.7361	66.9760	67.0210	67.2317	67.2317	67.2708	67.1504	67.0210	66.9299	66.8349	
alpha	5.4422	5.4457	5.4491	5.4651	5.4681	5.4821	5.4821	5.4847	5.4767	5.4681	5.4620	5.4557	
util living area													
	0.9966	0.9844	0.9450	0.8301	0.6478	0.4622	0.3333	0.3781	0.6142	0.9089	0.9896	0.9978	(86)
Living	19.8242	20.1301	20.4827	20.8075	20.9564	20.9941	20.9992	20.9984	20.9751	20.7207	20.1858	19.7619	
Non living	18.6005	18.9881	19.4215	19.7902	19.9328	19.9636	19.9661	19.9664	19.9516	19.7106	19.0643	18.5230	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	0	0	0	0	0	0	0	0	0	0	16	
16 / 9	0	28	31	0	0	0	0	0	0	0	22	15	
MIT	21.0000	20.5073	20.7070	20.8075	20.9564	20.9941	20.9992	20.9984	20.9751	20.7207	20.4447	20.6607	(87)
Th 2	19.9580	19.9588	19.9595	19.9628	19.9634	19.9663	19.9663	19.9669	19.9652	19.9634	19.9622	19.9608	(88)
util rest of house													
	0.9954	0.9792	0.9280	0.7881	0.5851	0.3894	0.2553	0.2938	0.5307	0.8733	0.9853	0.9970	(89)
MIT 2	19.9580	19.5303	19.7220	19.7902	19.9328	19.9636	19.9661	19.9664	19.9516	19.7106	19.4321	19.6538	(90)
Living area fraction										fLA = Living area / (4) =		0.1576	(91)
MIT	20.1223	19.6843	19.8773	19.9505	20.0941	20.1260	20.1289	20.1291	20.1129	19.8698	19.5917	19.8125	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1223	19.6843	19.8773	19.9505	20.0941	20.1260	20.1289	20.1291	20.1129	19.8698	19.5917	19.8125	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9957	0.9775	0.9264	0.7876	0.5933	0.4008	0.2676	0.3071	0.5430	0.8695	0.9832	0.9969	(94)
Useful gains	1352.3163	1780.5963	2066.6844	2082.8369	1721.8474	1156.8674	741.4139	782.5810	1242.9660	1601.1057	1411.8457	1248.3129	(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													
	3355.8120	3133.2321	2832.8765	2331.7713	1770.0464	1161.6035	741.8102	783.4227	1265.4892	1954.7011	2637.6884	3301.3357	(97)
Space heating kWh													
	1490.6007	908.9713	570.0469	179.2327	35.8601	0.0000	0.0000	0.0000	0.0000	263.0750	882.6067	1527.4490	(98a)
Space heating requirement - total per year (kWh/year)												5857.8424	
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													
	1490.6007	908.9713	570.0469	179.2327	35.8601	0.0000	0.0000	0.0000	0.0000	263.0750	882.6067	1527.4490	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5857.8424	
Space heating per m2											(98c) / (4) =	31.8361	(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 %)	317.7295	(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													
	1490.6007	908.9713	570.0469	179.2327	35.8601	0.0000	0.0000	0.0000	0.0000	263.0750	882.6067	1527.4490	(98)
Space heating efficiency (main heating system 1)													
	317.7295	317.7295	317.7295	317.7295	317.7295	0.0000	0.0000	0.0000	0.0000	317.7295	317.7295	317.7295	(210)
Space heating fuel (main heating system)													
	469.1414	286.0833	179.4126	56.4105	11.2863	0.0000	0.0000	0.0000	0.0000	82.7984	277.7855	480.7387	(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												
	293.1656	259.2066	275.0614	240.9124	232.9444	209.2471	205.9515	214.4377	217.1487	242.9423	259.3355	289.8262 (64)
Efficiency of water heater												166.8478 (216)
(217)m	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478	166.8478 (217)
Fuel for water heating, kWh/month												
	175.7084	155.3551	164.8577	144.3905	139.6149	125.4120	123.4368	128.5229	130.1478	145.6071	155.4324	173.7070 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	49.2837	39.5373	35.5989	26.0813	20.1459	16.4594	18.3778	23.8882	31.0284	40.7109	45.9828	50.6535 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1843.6568 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	166.8478
Water heating fuel used	1762.1926 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	397.7481 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	4003.5975 (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	1843.6568	0.1577	290.8166	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1762.1926	0.1410	248.4081	(264)
Space and water heating			539.2248	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	397.7481	0.1443	57.4073	(268)
Total CO2, kg/year			596.6321	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.2400	(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	1843.6568	1.5839	2920.1286	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1762.1926	1.5212	2680.7216	(278)
Space and water heating			5600.8502	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	397.7481	1.5338	610.0793	(282)
Total Primary energy kWh/year			6210.9295	(286)
Dwelling Primary energy Rate (DPER)			33.7600	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	80.0000 (1b)	x	2.4000 (2b)	=	192.0000 (1b)	-
First floor	64.0000 (1c)	x	2.4000 (2c)	=	153.6000 (1c)	-
Second floor	40.0000 (1d)	x	2.4000 (2d)	=	96.0000 (1d)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	184.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	441.6000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0906	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3406	(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) =	0.2895	(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	0.3691	0.3619	0.3546	0.3184	0.3112	0.2750	0.2750	0.2678	0.2895	0.3112	0.3257	0.3402	(22b)
Effective ac	0.5681	0.5655	0.5629	0.5507	0.5484	0.5378	0.5378	0.5359	0.5419	0.5484	0.5530	0.5579	(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 Opening Type (Uw = 1.20)			46.0000	1.1450	52.6718			(27)
Heatloss Floor 1			80.0000	0.1300	10.4000			(28a)
External Wall 1	274.0000	46.0000	228.0000	0.1800	41.0400			(29a)
External Roof 1	64.0000		64.0000	0.1100	7.0400			(30)
External Roof 2	16.0000		16.0000	0.1100	1.7600			(30)
Total net area of external elements Aum(A, m2)			434.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		112.9118			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							276.5071	(35)

List of Thermal Bridges

	Length	Psi-value	Total
E5 Ground floor (normal)	46.0000	0.1600	7.3600
E6 Intermediate floor within a dwelling	66.0000	0.0000	0.0000
E16 Corner (normal)	28.8000	0.0900	2.5920
E2 Other lintels (including other steel lintels)	25.0000	0.0500	1.2500
E3 Sill	20.0000	0.0500	1.0000
E4 Jamb	60.0000	0.0500	3.0000
E10 Eaves (insulation at ceiling level)	20.0000	0.0600	1.2000
E12 Gable (insulation at ceiling level)	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		17.1220	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	130.0338	(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	82.7908	82.4053	82.0275	80.2528	79.9208	78.3751	78.3751	78.0888	78.9704	79.9208	80.5925	81.2947	(38)
Heat transfer coeff	212.8245	212.4391	212.0612	210.2866	209.9545	208.4088	208.4088	208.1226	209.0042	209.9545	210.6262	211.3285	(39)
Average = Sum(39)m / 12 =												210.2850	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1567	1.1546	1.1525	1.1429	1.1411	1.1327	1.1327	1.1311	1.1359	1.1411	1.1447	1.1485	(40)
HLP (average)												1.1429	

Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9811	(42)
Hot water usage for mixer showers													
	74.2024	73.0873	71.4623	68.3533	66.0589	63.5002	62.0459	63.6585	65.4263	68.1735	71.3493	73.9181	(42a)
Hot water usage for baths													
	32.0327	31.5569	30.8870	29.6518	28.7269	27.7013	27.1473	27.8125	28.5369	29.6343	30.8950	31.9244	(42b)
Hot water usage for other uses													
	45.1590	43.5169	41.8747	40.2326	38.5904	36.9483	36.9483	38.5904	40.2326	41.8747	43.5169	45.1590	(42c)
Average daily hot water use (litres/day)												139.1651	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	151.3941	148.1611	144.2241	138.2377	133.3762	128.1498	126.1414	130.0615	134.1957	139.6825	145.7612	151.0015	(44)
Energy conte	239.7712	210.9794	221.6670	189.2404	179.5500	157.5751	152.5571	161.0433	165.4767	189.5479	207.6635	236.4318	(45)
Energy content (annual)										Total = Sum(45)m =		2311.5035	
Distribution loss (46)m = 0.15 x (45)m													
	35.9657	31.6469	33.2501	28.3861	26.9325	23.6363	22.8836	24.1565	24.8215	28.4322	31.1495	35.4648	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	286.3661	253.0651	268.2619	234.3323	226.1449	202.6669	199.1520	207.6382	210.5686	236.1428	252.7553	283.0267	(62)
WWHRS	-33.9222	-30.0011	-31.4154	-26.0132	-24.2434	-20.7452	-19.4453	-20.6782	-21.4638	-25.3035	-28.6658	-33.2940	(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													
	252.4439	223.0640	236.8465	208.3191	201.9015	181.9217	179.7067	186.9600	189.1047	210.8393	224.0896	249.7327	(64)
										Total per year (kWh/year) = Sum(64)m =		2544.9297	(64)
12Total per year (kWh/year)												2545	(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													
	116.9999	103.8192	110.9802	98.9959	96.9763	88.4672	88.0012	90.8228	91.0945	100.3006	105.1216	115.8895	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	149.0529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	179.3457	198.5614	179.3457	185.3239	179.3457	185.3239	179.3457	179.3457	185.3239	179.3457	185.3239	179.3457	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	355.5730	359.2627	349.9647	330.1704	305.1835	281.6994	266.0106	262.3209	271.6189	291.4132	316.4001	339.8842	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	37.9053	(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)													
	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	-119.2423	(71)
Water heating gains (Table 5)													
	157.2579	154.4929	149.1669	137.4943	130.3445	122.8711	118.2811	122.0737	126.5201	134.8126	146.0022	155.7655	(72)
Total internal gains													
	762.8925	783.0329	749.1933	723.7045	685.5896	657.6103	631.3533	631.4561	651.1788	676.2875	718.4421	745.7113	(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	8.7000	10.6334	0.6300	0.7000	0.7700	28.2724	(74)
East	15.5700	19.6403	0.6300	0.7000	0.7700	93.4561	(76)
South	17.8500	46.7521	0.6300	0.7000	0.7700	255.0415	(78)
West	3.8800	19.6403	0.6300	0.7000	0.7700	23.2890	(80)

Solar gains	400.0590	700.1005	999.9825	1297.3494	1497.5430	1503.8871	1442.9346	1292.5155	1103.6185	785.8260	482.7563	339.9541	(83)
Total gains	1162.9515	1483.1334	1749.1757	2021.0539	2183.1326	2161.4974	2074.2879	1923.9717	1754.7973	1462.1134	1201.1983	1085.6654	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)													
tau	66.4049	66.5253	66.6439	67.2063	67.3126	67.8118	67.8118	67.9051	67.6187	67.3126	67.0979	66.8750	
alpha	5.4270	5.4350	5.4429	5.4804	5.4875	5.5208	5.5208	5.5270	5.5079	5.4875	5.4732	5.4583	
util living area	0.9984	0.9939	0.9795	0.9249	0.7950	0.5999	0.4393	0.4923	0.7529	0.9605	0.9955	0.9989	(86)
MIT	19.7151	19.9547	20.2684	20.6366	20.8832	20.9800	20.9969	20.9945	20.9349	20.5805	20.0682	19.6742	(87)
Th 2	19.9548	19.9565	19.9582	19.9660	19.9674	19.9743	19.9743	19.9755	19.9716	19.9674	19.9645	19.9614	(88)
util rest of house	0.9978	0.9917	0.9718	0.8986	0.7353	0.5115	0.3384	0.3855	0.6668	0.9410	0.9935	0.9985	(89)
MIT 2	18.4588	18.7657	19.1625	19.6132	19.8773	19.9642	19.9734	19.9739	19.9322	19.5592	18.9177	18.4113	(90)
Living area fraction										fLA = Living area / (4) =		0.1576	(91)
MIT	18.6568	18.9531	19.3368	19.7745	20.0358	20.1243	20.1347	20.1347	20.0902	19.7202	19.0990	18.6103	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6568	18.9531	19.3368	19.7745	20.0358	20.1243	20.1347	20.1347	20.0902	19.7202	19.0990	18.6103	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9967	0.9886	0.9658	0.8928	0.7396	0.5248	0.3544	0.4024	0.6776	0.9349	0.9910	0.9977	(94)
Useful gains	1159.1349	1466.2885	1689.4149	1804.4190	1614.6653	1134.4184	735.1050	774.1773	1189.1310	1366.8932	1190.3594	1083.1546	(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	3055.4871	2985.4269	2722.1895	2286.7556	1750.1394	1151.3139	736.6722	777.2778	1251.9821	1914.8229	2527.3140	3045.3123	(97)
Space heating kWh	1410.8860	1020.8610	768.3843	347.2823	100.7928	0.0000	0.0000	0.0000	0.0000	407.6597	962.6073	1459.8454	(98a)
Space heating requirement - total per year (kWh/year)												6478.3188	
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	1410.8860	1020.8610	768.3843	347.2823	100.7928	0.0000	0.0000	0.0000	0.0000	407.6597	962.6073	1459.8454	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6478.3188	
Space heating per m2											(98c) / (4) =	35.2083	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1410.8860	1020.8610	768.3843	347.2823	100.7928	0.0000	0.0000	0.0000	0.0000	407.6597	962.6073	1459.8454	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	1528.5872	1106.0249	832.4857	376.2539	109.2013	0.0000	0.0000	0.0000	0.0000	441.6681	1042.9115	1581.6309	(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	252.4439	223.0640	236.8465	208.3191	201.9015	181.9217	179.7067	186.9600	189.1047	210.8393	224.0896	249.7327	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.3056	87.0397	86.5014	85.1973	82.5872	79.8000	79.8000	79.8000	79.8000	85.5124	86.9483	87.3607	(217)
Fuel for water heating, kWh/month	289.1497	256.2786	273.8066	244.5138	244.4707	227.9721	225.1964	234.2857	236.9734	246.5600	257.7275	285.8638	(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	37.2645	29.8950	26.9171	19.7206	15.2328	12.4453	13.8958	18.0624	23.4612	30.7824	34.7686	38.3002	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-70.2264	-96.7363	-135.8497	-149.0243	-157.4900	-145.6856	-143.6720	-137.0445	-125.0999	-108.6140	-76.3051	-60.9660	(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	-46.9093	-97.7473	-192.6615	-287.1381	-377.6576	-378.9010	-374.6390	-318.2979	-234.6269	-139.2801	-62.4434	-37.1844	(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	7018.7636	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3022.7980	(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)	300.7459	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3954.2004	(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	6474.1071	(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	7018.7636	0.2100	1473.9404	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3022.7980	0.2100	634.7876	(264)
Space and water heating			2108.7279	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	300.7459	0.1443	43.4069	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1406.7138	0.1351	-190.0809	
PV Unit electricity exported	-2547.4866	0.1261	-321.2718	
Total			-511.3528	(269)
Total CO2, kg/year			1652.7114	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.9800	(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	7018.7636	1.1300	7931.2029	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3022.7980	1.1300	3415.7618	(278)
Space and water heating			11346.9647	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	300.7459	1.5338	461.2941	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1406.7138	1.4994	-2109.2632	
PV Unit electricity exported	-2547.4866	0.4629	-1179.3111	
Total			-3288.5742	(283)
Total Primary energy kWh/year			8649.7853	(286)
Target Primary Energy Rate (TPER)			47.0100	(287)

Full SAP Calculation Printout

Property Reference	House Type C	Issued on Date	05/10/2023
Assessment Reference	Plot 54	Prop Type Ref	
Property			

SAP Rating	82 B	DER	4.46	TER	10.44
Environmental	96 A	% DER < TER			57.28
CO_2 Emissions (t/year)	0.33	DFEE	28.75	TFEE	32.75
Compliance Check	See BREL	% DFEE < TFEE			12.20
% DPER < TPER	13.24	DPER	47.14	TPER	54.33

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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	40.0000 (1b)	x	2.4000 (2b)	=	96.0000 (1b)	-
First floor	40.0000 (1c)	x	2.4000 (2c)	=	96.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	192.0000	(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	1 * 10 =	10.0000	(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) =	10.0000 / (5) =	0.0521	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2521	(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) =	0.2143	(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	0.2732	0.2678	0.2625	0.2357	0.2303	0.2036	0.2036	0.1982	0.2143	0.2303	0.2411	0.2518	(22b)
Effective ac	0.5373	0.5359	0.5344	0.5278	0.5265	0.5207	0.5207	0.5196	0.5230	0.5265	0.5291	0.5317	(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	
Opening Type 1 (Uw = 1.20)			14.7300	1.1450	16.8664			(27)
Heatloss Floor 1			40.0000	0.1200	4.8000	110.0000	4400.0000	(28a)
External Wall 1	86.4000	14.7300	71.6700	0.1900	13.6173	190.0000	13617.3000	(29a)
External Roof 1	40.0000		40.0000	0.1500	6.0000	9.0000	360.0000	(30)
Total net area of external elements Aum(A, m2)			166.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.2837			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18377.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 229.7163 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	18.0000	0.0670	1.2060
E6 Intermediate floor within a dwelling	18.0000	0.0020	0.0360
E16 Corner (normal)	9.6000	0.0410	0.3936
E18 Party wall between dwellings	9.6000	0.0400	0.3840
E2 Other lintels (including other steel lintels)	12.6600	0.0240	0.3038
E3 Sill	9.5100	0.0190	0.1807
E4 Jamb	36.0000	0.0140	0.5040
E11 Eaves (insulation at rafter level)	10.0000	0.0110	0.1100
E12 Gable (insulation at ceiling level)	18.0000	0.0330	0.5940

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.7121 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.9958 (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	34.0445	33.9526	33.8626	33.4399	33.3608	32.9927	32.9927	32.9245	33.1345	33.3608	33.5208	33.6881	(38)
Heat transfer coeff	79.0403	78.9485	78.8585	78.4358	78.3567	77.9885	77.9885	77.9203	78.1303	78.3567	78.5167	78.6840	(39)

Average = Sum(39)m / 12 = 78.4354

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9880	0.9869	0.9857	0.9804	0.9795	0.9749	0.9749	0.9740	0.9766	0.9795	0.9815	0.9835	(40)
HLP (average)												0.9804	
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 2.4629 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5138	64.5292	63.0946	60.3496	58.3238	56.0648	54.7807	56.2045	57.7653	60.1909	62.9948	65.2628	(42a)
Hot water usage for baths	28.2963	27.8761	27.2843	26.1931	25.3761	24.4701	23.9808	24.5684	25.2083	26.1777	27.2913	28.2006	(42b)
Hot water usage for other uses	39.8522	38.4030	36.9538	35.5047	34.0555	32.6063	32.6063	34.0555	35.5047	36.9538	38.4030	39.8522	(42c)

Average daily hot water use (litres/day) 122.8659 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6623	130.8083	127.3327	122.0474	117.7554	113.1412	111.3678	114.8284	118.4782	123.3223	128.6891	133.3156	(44)
Energy conte	211.6883	186.2693	195.7056	167.0767	158.5214	139.1203	134.6897	142.1816	146.0955	167.3473	183.3412	208.7400	(45)

Energy content (annual) Total = Sum(45)m = 2040.7768

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Distribution loss (46)m = 0.15 x (45)m	31.7533	27.9404	29.3558	25.0615	23.7782	20.8680	20.2035	21.3272	21.9143	25.1021	27.5012	31.3110	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	265.0827	234.4965	249.1000	218.7487	211.9158	190.7923	188.0841	195.5760	197.7675	220.7417	235.0132	262.1344	(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	265.0827	234.4965	249.1000	218.7487	211.9158	190.7923	188.0841	195.5760	197.7675	220.7417	235.0132	262.1344	(64)

Total per year (kWh/year) = Sum(64)m = 2669.4528 (64)
12Total per year (kWh/year) 2669 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating, kWh/month	113.1019	100.5163	107.7876	96.8906	95.4239	87.5951	87.4998	89.9909	89.9143	98.3585	102.2985	112.1216	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.6506	124.7203	112.6506	116.4056	112.6506	116.4056	112.6506	112.6506	116.4056	112.6506	116.4056	112.6506	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	(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)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	(71)

Water heating gains (Table 5)

	152.0187	149.5778	144.8758	134.5703	128.2579	121.6599	117.6073	120.9555	124.8810	132.2023	142.0813	150.7010 (72)

Total internal gains

	544.0527	555.9587	533.4488	514.6822	489.1943	471.8581	454.3683	455.4393	468.8581	484.6404	513.6950	533.0528 (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
East	3.8000	19.6403	0.7600	0.7000	0.7700	27.5154 (76)
South	3.9500	46.7521	0.7600	0.7000	0.7700	68.0836 (78)
West	6.9800	19.6403	0.7600	0.7000	0.7700	50.5414 (80)

Solar gains	146.1405	264.1992	393.5037	527.2823	616.7508	621.0973	595.3379	529.0276	440.8408	301.4533	178.0300	123.0207 (83)
Total gains	690.1932	820.1579	926.9525	1041.9646	1105.9451	1092.9555	1049.7062	984.4669	909.6989	786.0937	691.7250	656.0735 (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	64.5848	64.6600	64.7337	65.0826	65.1483	65.4559	65.4559	65.5131	65.3371	65.1483	65.0156	64.8773	
alpha	5.3057	5.3107	5.3156	5.3388	5.3432	5.3637	5.3637	5.3675	5.3558	5.3432	5.3344	5.3252	
util living area	0.9844	0.9630	0.9155	0.8004	0.6329	0.4529	0.3264	0.3631	0.5774	0.8571	0.9659	0.9878	(86)
Living	20.0531	20.2884	20.5640	20.8297	20.9574	20.9940	20.9991	20.9985	20.9795	20.7910	20.3735	20.0029	
Non living	19.0087	19.3025	19.6369	19.9404	20.0676	20.1010	20.1041	20.1045	20.0902	19.9086	19.4159	18.9483	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5156	20.2884	20.5640	20.8297	20.9574	20.9940	20.9991	20.9985	20.9795	20.7910	20.3735	20.1424	(87)
Th 2	20.0933	20.0943	20.0952	20.0997	20.1005	20.1043	20.1043	20.1051	20.1029	20.1005	20.0988	20.0971	(88)
util rest of house	0.9803	0.9538	0.8960	0.7626	0.5795	0.3912	0.2602	0.2930	0.5083	0.8185	0.9558	0.9844	(89)
MIT 2	19.6609	19.3025	19.6369	19.9404	20.0676	20.1010	20.1041	20.1045	20.0902	19.9086	19.4159	19.1553	(90)
Living area fraction										fLA = Living area / (4) =		0.2250	(91)
MIT	19.8532	19.5243	19.8455	20.1405	20.2678	20.3019	20.3055	20.3057	20.2903	20.1071	19.6314	19.3774	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8532	19.5243	19.8455	20.1405	20.2678	20.3019	20.3055	20.3057	20.2903	20.1071	19.6314	19.3774	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9789	0.9467	0.8899	0.7645	0.5897	0.4049	0.2751	0.3087	0.5231	0.8189	0.9492	0.9810	(94)
Useful gains	675.6575	776.4733	824.8914	796.5400	652.2172	442.5585	288.7755	303.9449	475.8258	643.6993	656.5976	643.6150	(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	1229.3318	1154.5680	1052.4022	881.6560	671.3449	444.6858	288.9828	304.3307	483.6521	744.9475	983.9228	1194.2195	(97)
Space heating kWh	411.9337	254.0796	169.2680	61.2835	14.2310	0.0000	0.0000	0.0000	0.0000	75.3286	235.6742	409.6498	(98a)
Space heating requirement - total per year (kWh/year)												1631.4484	
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	411.9337	254.0796	169.2680	61.2835	14.2310	0.0000	0.0000	0.0000	0.0000	75.3286	235.6742	409.6498	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1631.4484	
Space heating per m2											(98c) / (4) =	20.3931	(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 %) 252.4076 (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	411.9337	254.0796	169.2680	61.2835	14.2310	0.0000	0.0000	0.0000	0.0000	75.3286	235.6742	409.6498	(98)
Space heating efficiency (main heating system 1)	252.4076	252.4076	252.4076	252.4076	252.4076	0.0000	0.0000	0.0000	0.0000	252.4076	252.4076	252.4076	(210)
Space heating fuel (main heating system)	163.2018	100.6624	67.0614	24.2796	5.6381	0.0000	0.0000	0.0000	0.0000	29.8440	93.3705	162.2969	(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												
	265.0827	234.4965	249.1000	218.7487	211.9158	190.7923	188.0841	195.5760	197.7675	220.7417	235.0132	262.1344 (64)
Efficiency of water heater												170.5433 (216)
(217)m	170.5433	170.5433	170.5433	170.5433	170.5433	170.5433	170.5433	170.5433	170.5433	170.5433	170.5433	170.5433 (217)
Fuel for water heating, kWh/month												
	155.4343	137.4997	146.0626	128.2658	124.2593	111.8733	110.2853	114.6782	115.9632	129.4344	137.8027	153.7055 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	29.6481	23.7848	21.4156	15.6900	12.1194	9.9016	11.0557	14.3706	18.6660	24.4908	27.6623	30.4721 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	646.3547 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	170.5433
Water heating fuel used	1565.2643 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	239.2771 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	2450.8960 (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	646.3547	0.1575	101.7966	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1565.2643	0.1409	220.5508	(264)
Space and water heating			322.3474	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	239.2771	0.1443	34.5351	(268)
Total CO2, kg/year			356.8825	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4600	(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	646.3547	1.5830	1023.1692	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1565.2643	1.5210	2380.7814	(278)
Space and water heating			3403.9506	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	239.2771	1.5338	367.0112	(282)
Total Primary energy kWh/year			3770.9618	(286)
Dwelling Primary energy Rate (DPER)			47.1400	(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	40.0000 (1b)	x	2.4000 (2b)	=	96.0000 (1b)	-
First floor	40.0000 (1c)	x	2.4000 (2c)	=	96.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	192.0000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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) =	0.1562 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4062 (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) =	0.3453 (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	0.4403	0.4316	0.4230	0.3798	0.3712	0.3280	0.3280	0.3194	0.3453	0.3712	0.3885	0.4057	(22b)
Effective ac	0.5969	0.5932	0.5895	0.5721	0.5689	0.5538	0.5538	0.5510	0.5596	0.5689	0.5755	0.5823	(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 Opening Type (Uw = 1.20)			14.7300	1.1450	16.8664			(27)
Heatloss Floor 1			40.0000	0.1300	5.2000			(28a)
External Wall 1	86.4000	14.7300	71.6700	0.1800	12.9006			(29a)
External Roof 1	40.0000		40.0000	0.1100	4.4000			(30)
Total net area of external elements Aum(A, m2)			166.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.3670			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 229.7163 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	18.0000	0.1600	2.8800
E6 Intermediate floor within a dwelling	18.0000	0.0000	0.0000
E16 Corner (normal)	9.6000	0.0900	0.8640
E18 Party wall between dwellings	9.6000	0.0600	0.5760
E2 Other lintels (including other steel lintels)	12.6600	0.0500	0.6330
E3 Sill	9.5100	0.0500	0.4755
E4 Jamb	36.0000	0.0500	1.8000
E11 Eaves (insulation at rafter level)	10.0000	0.0400	0.4000
E12 Gable (insulation at ceiling level)	18.0000	0.0600	1.0800

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.7085 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	48.0755 (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	37.8209	37.5824	37.3487	36.2508	36.0454	35.0892	35.0892	34.9122	35.4575	36.0454	36.4610	36.8954	(38)
Heat transfer coeff	85.8964	85.6579	85.4242	84.3263	84.1209	83.1647	83.1647	82.9877	83.5331	84.1209	84.5365	84.9709	(39)
Average = Sum(39)m / 12 =												84.3254	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0737	1.0707	1.0678	1.0541	1.0515	1.0396	1.0396	1.0373	1.0442	1.0515	1.0567	1.0621	(40)
HLP (average)												1.0541	
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												2.4629 (42)
Hot water usage for mixer showers												
	65.5138	64.5292	63.0946	60.3496	58.3238	56.0648	54.7807	56.2045	57.7653	60.1909	62.9948	65.2628 (42a)
Hot water usage for baths												
	28.2963	27.8761	27.2843	26.1931	25.3761	24.4701	23.9808	24.5684	25.2083	26.1777	27.2913	28.2006 (42b)
Hot water usage for other uses												
	39.8522	38.4030	36.9538	35.5047	34.0555	32.6063	32.6063	34.0555	35.5047	36.9538	38.4030	39.8522 (42c)
Average daily hot water use (litres/day)												122.8659 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6623	130.8083	127.3327	122.0474	117.7554	113.1412	111.3678	114.8284	118.4782	123.3223	128.6891	133.3156	(44)
Energy conte	211.6883	186.2693	195.7056	167.0767	158.5214	139.1203	134.6897	142.1816	146.0955	167.3473	183.3412	208.7400	(45)
Energy content (annual)										Total = Sum(45)m =		2040.7768	
Distribution loss (46)m = 0.15 x (45)m													
	31.7533	27.9404	29.3558	25.0615	23.7782	20.8680	20.2035	21.3272	21.9143	25.1021	27.5012	31.3110	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2832	228.3550	242.3005	212.1686	205.1163	184.2121	181.2846	188.7765	191.1873	213.9422	228.4330	255.3349	(62)
WWHRS	-29.9502	-26.4882	-27.7369	-22.9672	-21.4046	-18.3161	-17.1684	-18.2569	-18.9505	-22.3406	-25.3092	-29.3955	(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													
	228.3331	201.8668	214.5636	189.2013	183.7117	165.8960	164.1162	170.5196	172.2368	191.6015	203.1238	225.9393	(64)
										Total per year (kWh/year) = Sum(64)m =		2311.1097	(64)
12Total per year (kWh/year)												2311	(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													
	107.6623	95.6031	102.3480	91.6265	89.9843	82.3310	82.0602	84.5513	84.6502	92.9189	97.0344	106.6820	(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	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	112.6506	124.7203	112.6506	116.4056	112.6506	116.4056	112.6506	112.6506	116.4056	112.6506	116.4056	112.6506	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	(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)													
	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	(71)
Water heating gains (Table 5)													
	144.7074	142.2665	137.5645	127.2590	120.9466	114.3486	110.2960	113.6442	117.5697	124.8910	134.7700	143.3897	(72)
Total internal gains													
	539.7414	551.6474	529.1375	510.3709	484.8830	464.5469	447.0570	448.1281	461.5468	480.3291	509.3837	528.7415	(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	
East	3.8000	19.6403	0.6300	0.7000	0.7700	22.8088	(76)
South	3.9500	46.7521	0.6300	0.7000	0.7700	56.4378	(78)
West	6.9800	19.6403	0.6300	0.7000	0.7700	41.8962	(80)

Solar gains	121.1428	219.0072	326.1939	437.0893	511.2539	514.8570	493.5038	438.5360	365.4338	249.8889	147.5775	101.9777	(83)
Total gains	660.8842	770.6546	855.3314	947.4603	996.1369	979.4039	940.5608	886.6641	826.9807	730.2180	656.9612	630.7192	(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	59.4298	59.5952	59.7583	60.5363	60.6841	61.3818	61.3818	61.5128	61.1112	60.6841	60.3858	60.0771	
alpha	4.9620	4.9730	4.9839	5.0358	5.0456	5.0921	5.0921	5.1009	5.0741	5.0456	5.0257	5.0051	
util living area													
	0.9884	0.9748	0.9451	0.8636	0.7205	0.5321	0.3871	0.4272	0.6589	0.9001	0.9755	0.9906	(86)
MIT	19.8645	20.0869	20.3740	20.7051	20.9057	20.9837	20.9973	20.9957	20.9540	20.6823	20.2210	19.8306	(87)
Th 2	20.0224	20.0248	20.0272	20.0385	20.0406	20.0505	20.0505	20.0523	20.0467	20.0406	20.0363	20.0319	(88)
util rest of house													
	0.9851	0.9680	0.9305	0.8307	0.6640	0.4579	0.3046	0.3409	0.5818	0.8675	0.9677	0.9879	(89)
MIT 2	18.7179	18.9992	19.3557	19.7535	19.9653	20.0414	20.0496	20.0508	20.0173	19.7397	19.1796	18.6820	(90)
Living area fraction										fLA = Living area / (4) =		0.2250	(91)
MIT	18.9759	19.2440	19.5848	19.9676	20.1769	20.2534	20.2628	20.2634	20.2281	19.9518	19.4139	18.9404	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9759	19.2440	19.5848	19.9676	20.1769	20.2534	20.2628	20.2634	20.2281	19.9518	19.4139	18.9404	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9803	0.9609	0.9225	0.8280	0.6724	0.4740	0.3232	0.3603	0.5971	0.8640	0.9611	0.9837	(94)
Useful gains	647.8456	740.5573	789.0479	784.4705	669.8394	464.2704	303.9573	319.4669	493.8112	630.9411	631.3868	620.4494	(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													
	1260.6030	1228.6747	1117.7581	933.2914	713.0825	470.1625	304.6195	320.6110	511.8980	786.6804	1040.9728	1252.5069	(97)
Space heating kWh													
	455.8915	328.0149	244.5604	107.1510	32.1729	0.0000	0.0000	0.0000	0.0000	115.8701	294.9019	470.2508	(98a)
Space heating requirement - total per year (kWh/year)												2048.8134	
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													
	455.8915	328.0149	244.5604	107.1510	32.1729	0.0000	0.0000	0.0000	0.0000	115.8701	294.9019	470.2508	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2048.8134	
Space heating per m2											(98c) / (4) =	25.6102	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	455.8915	328.0149	244.5604	107.1510	32.1729	0.0000	0.0000	0.0000	0.0000	115.8701	294.9019	470.2508	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	493.9237	355.3791	264.9625	116.0900	34.8568	0.0000	0.0000	0.0000	0.0000	125.5364	319.5037	509.4808	(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													
	228.3331	201.8668	214.5636	189.2013	183.7117	165.8960	164.1162	170.5196	172.2368	191.6015	203.1238	225.9393	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.5791	85.1418	84.3540	82.8355	81.0238	79.8000	79.8000	79.8000	79.8000	82.9689	84.8949	85.6645	(217)
Fuel for water heating, kWh/month													
	266.8094	237.0949	254.3609	228.4060	226.7379	207.8898	205.6593	213.6837	215.8355	230.9317	239.2650	263.7491	(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	23.4066	18.7776	16.9072	12.3869	9.5680	7.8171	8.7283	11.3453	14.7364	19.3350	21.8389	24.0571	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.2699	-52.4658	-75.3087	-84.5553	-91.0790	-84.9747	-83.9148	-79.2586	-71.0385	-59.9237	-40.9422	-32.2304	(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	-21.2980	-44.7760	-88.9470	-133.5259	-176.4948	-177.3186	-175.2407	-148.4127	-108.8249	-64.0234	-28.4321	-16.8448	(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												2219.7328	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	79.8000
Water heating fuel used	2790.4232 (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)	188.9044 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1977.1002 (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	3307.9603 (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	2219.7328	0.2100	466.1439	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2790.4232	0.2100	585.9889	(264)
Space and water heating			1052.1328	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	188.9044	0.1443	27.2647	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-792.9615	0.1346	-106.7462	
PV Unit electricity exported	-1184.1387	0.1259	-149.0945	
Total			-255.8407	(269)
Total CO2, kg/year			835.4860	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4400	(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	2219.7328	1.1300	2508.2981	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2790.4232	1.1300	3153.1782	(278)
Space and water heating			5661.4764	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	188.9044	1.5338	289.7479	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-792.9615	1.4975	-1187.4788	
PV Unit electricity exported	-1184.1387	0.4622	-547.2802	
Total			-1734.7590	(283)
Total Primary energy kWh/year			4346.5661	(286)
Target Primary Energy Rate (TPER)			54.3300	(287)

Full SAP Calculation Printout

Property Reference	House Type C	Issued on Date	05/10/2023
Assessment Reference	Plot 55	Prop Type Ref	
Property			

SAP Rating	81 B	DER	4.62	TER	10.97
Environmental	96 A	% DER < TER			57.89
CO_2 Emissions (t/year)	0.34	DFEE	31.39	TFEE	35.17
Compliance Check	See BREL	% DFEE < TFEE			10.77
% DPER < TPER	14.72	DPER	48.76	TPER	57.18

Assessor Details	Mr. Joe Mountain	Assessor ID	AV71-0001
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			40.0000 (1b)	x	2.4000 (2b)	=	96.0000 (1b)	-
First floor			40.0000 (1c)	x	2.4000 (2c)	=	96.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000							(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	192.0000	(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		1 * 10	=	10.0000 (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) =		10.0000 / (5)	=	0.0521 (8)
Pressure test		Yes		
Pressure Test Method		Blower Door		
Measured/design AP50		4.0000		(17)
Infiltration rate		0.2521		(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)	=	0.2143	(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	0.2732	0.2678	0.2625	0.2357	0.2303	0.2036	0.2036	0.1982	0.2143	0.2303	0.2411	0.2518	(22b)
Effective ac	0.5373	0.5359	0.5344	0.5278	0.5265	0.5207	0.5207	0.5196	0.5230	0.5265	0.5291	0.5317	(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	
Opening Type 1 (Uw = 1.20)			14.7300	1.1450	16.8664			(27)
Heatloss Floor 1			40.0000	0.1200	4.8000	110.0000	4400.0000	(28a)
External Wall 1	86.4000	14.7300	71.6700	0.1900	13.6173	190.0000	13617.3000	(29a)
External Roof 1	40.0000		40.0000	0.1500	6.0000	9.0000	360.0000	(30)
Total net area of external elements Aum(A, m2)			166.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.2837			(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 18377.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 229.7163 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	18.0000	0.0670	1.2060
E6 Intermediate floor within a dwelling	18.0000	0.0020	0.0360
E16 Corner (normal)	9.6000	0.0410	0.3936
E18 Party wall between dwellings	9.6000	0.0400	0.3840
E2 Other lintels (including other steel lintels)	12.6600	0.0240	0.3038
E3 Sill	9.5100	0.0190	0.1807
E4 Jamb	36.0000	0.0140	0.5040
E11 Eaves (insulation at rafter level)	10.0000	0.0110	0.1100
E12 Gable (insulation at ceiling level)	18.0000	0.0330	0.5940

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.7121 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.9958 (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	34.0445	33.9526	33.8626	33.4399	33.3608	32.9927	32.9927	32.9245	33.1345	33.3608	33.5208	33.6881	(38)
Heat transfer coeff	79.0403	78.9485	78.8585	78.4358	78.3567	77.9885	77.9885	77.9203	78.1303	78.3567	78.5167	78.6840	(39)

Average = Sum(39)m / 12 = 78.4354

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9880	0.9869	0.9857	0.9804	0.9795	0.9749	0.9749	0.9740	0.9766	0.9795	0.9815	0.9835	(40)
HLP (average)												0.9804	
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 2.4629 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.5138	64.5292	63.0946	60.3496	58.3238	56.0648	54.7807	56.2045	57.7653	60.1909	62.9948	65.2628	(42a)
Hot water usage for baths	28.2963	27.8761	27.2843	26.1931	25.3761	24.4701	23.9808	24.5684	25.2083	26.1777	27.2913	28.2006	(42b)
Hot water usage for other uses	39.8522	38.4030	36.9538	35.5047	34.0555	32.6063	32.6063	34.0555	35.5047	36.9538	38.4030	39.8522	(42c)

Average daily hot water use (litres/day) 122.8659 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.6623	130.8083	127.3327	122.0474	117.7554	113.1412	111.3678	114.8284	118.4782	123.3223	128.6891	133.3156	(44)
Energy conte	211.6883	186.2693	195.7056	167.0767	158.5214	139.1203	134.6897	142.1816	146.0955	167.3473	183.3412	208.7400	(45)

Energy content (annual) Total = Sum(45)m = 2040.7768

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Distribution loss (46)m = 0.15 x (45)m	31.7533	27.9404	29.3558	25.0615	23.7782	20.8680	20.2035	21.3272	21.9143	25.1021	27.5012	31.3110	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	265.0827	234.4965	249.1000	218.7487	211.9158	190.7923	188.0841	195.5760	197.7675	220.7417	235.0132	262.1344	(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	265.0827	234.4965	249.1000	218.7487	211.9158	190.7923	188.0841	195.5760	197.7675	220.7417	235.0132	262.1344	(64)

Total per year (kWh/year) = Sum(64)m = 2669.4528 (64)
12Total per year (kWh/year) 2669 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating, kWh/month	113.1019	100.5163	107.7876	96.8906	95.4239	87.5951	87.4998	89.9909	89.9143	98.3585	102.2985	112.1216	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.6506	124.7203	112.6506	116.4056	112.6506	116.4056	112.6506	112.6506	116.4056	112.6506	116.4056	112.6506	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	(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)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	(71)

Water heating gains (Table 5)

	152.0187	149.5778	144.8758	134.5703	128.2579	121.6599	117.6073	120.9555	124.8810	132.2023	142.0813	150.7010 (72)

Total internal gains

	544.0527	555.9587	533.4488	514.6822	489.1943	471.8581	454.3683	455.4393	468.8581	484.6404	513.6950	533.0528 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	3.9500	10.6334	0.7600	0.7000	0.7700	15.4851 (74)
East	3.8000	19.6403	0.7600	0.7000	0.7700	27.5154 (76)
West	6.9800	19.6403	0.7600	0.7000	0.7700	50.5414 (80)

Solar gains	93.5419	182.2885	301.7535	447.5225	558.2737	576.5902	546.7927	462.5515	352.9272	216.4127	116.4306	77.0993 (83)
Total gains	637.5947	738.2472	835.2023	962.2047	1047.4680	1048.4484	1001.1609	917.9908	821.7853	701.0531	630.1255	610.1521 (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	64.5848	64.6600	64.7337	65.0826	65.1483	65.4559	65.4559	65.5131	65.3371	65.1483	65.0156	64.8773	
alpha	5.3057	5.3107	5.3156	5.3388	5.3432	5.3637	5.3637	5.3675	5.3558	5.3432	5.3344	5.3252	
util living area	0.9890	0.9758	0.9411	0.8364	0.6618	0.4714	0.3420	0.3889	0.6307	0.8983	0.9767	0.9912	(86)
Living	19.9808	20.1857	20.4714	20.7864	20.9475	20.9927	20.9989	20.9979	20.9691	20.7258	20.2955	19.9388	
Non living	18.9178	19.1760	19.5285	19.8959	20.0595	20.1003	20.1040	20.1043	20.0833	19.8402	19.3203	18.8674	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4786	20.1857	20.4714	20.7864	20.9475	20.9927	20.9989	20.9979	20.9691	20.7258	20.2955	20.0873	(87)
Th 2	20.0933	20.0943	20.0952	20.0997	20.1005	20.1043	20.1043	20.1051	20.1029	20.1005	20.0988	20.0971	(88)
util rest of house	0.9859	0.9694	0.9261	0.8015	0.6078	0.4074	0.2728	0.3141	0.5582	0.8665	0.9693	0.9887	(89)
MIT 2	19.6247	19.1760	19.5285	19.8959	20.0595	20.1003	20.1040	20.1043	20.0833	19.8402	19.3203	19.0890	(90)
Living area fraction										fLA = Living area / (4) =		0.2250	(91)
MIT	19.8168	19.4032	19.7407	20.0963	20.2593	20.3011	20.3053	20.3054	20.2826	20.0395	19.5397	19.3136	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8168	19.4032	19.7407	20.0963	20.2593	20.3011	20.3053	20.3054	20.2826	20.0395	19.5397	19.3136	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9848	0.9632	0.9192	0.8014	0.6177	0.4216	0.2884	0.3309	0.5732	0.8640	0.9635	0.9859	(94)
Useful gains	627.9206	711.0452	767.7250	771.0978	646.9998	442.0388	288.7121	303.7638	471.0766	605.7235	607.1096	601.5222	(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	1226.4539	1145.0059	1044.1403	878.1897	670.6782	444.6205	288.9743	304.3069	483.0508	739.6461	976.7272	1189.1986	(97)
Space heating kWh	445.3088	291.6216	205.6530	77.1061	17.6167	0.0000	0.0000	0.0000	0.0000	99.6384	266.1247	437.2313	(98a)
Space heating requirement - total per year (kWh/year)												1840.3006	
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	445.3088	291.6216	205.6530	77.1061	17.6167	0.0000	0.0000	0.0000	0.0000	99.6384	266.1247	437.2313	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1840.3006	
Space heating per m2										(98c) / (4) =		23.0038	(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 %)	252.4076 (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	445.3088	291.6216	205.6530	77.1061	17.6167	0.0000	0.0000	0.0000	0.0000	99.6384	266.1247	437.2313	(98)
Space heating efficiency (main heating system 1)	252.4076	252.4076	252.4076	252.4076	252.4076	0.0000	0.0000	0.0000	0.0000	252.4076	252.4076	252.4076	(210)
Space heating fuel (main heating system)	176.4245	115.5360	81.4766	30.5483	6.9795	0.0000	0.0000	0.0000	0.0000	39.4752	105.4345	173.2243	(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												
	265.0827	234.4965	249.1000	218.7487	211.9158	190.7923	188.0841	195.5760	197.7675	220.7417	235.0132	262.1344 (64)
Efficiency of water heater												170.5433 (216)
(217)m	170.5433	170.5433	170.5433	170.5433	170.5433	170.5433	170.5433	170.5433	170.5433	170.5433	170.5433	170.5433 (217)
Fuel for water heating, kWh/month												
	155.4343	137.4997	146.0626	128.2658	124.2593	111.8733	110.2853	114.6782	115.9632	129.4344	137.8027	153.7055 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	29.6481	23.7848	21.4156	15.6900	12.1194	9.9016	11.0557	14.3706	18.6660	24.4908	27.6623	30.4721 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year	
Space heating fuel - main system 1	729.0987 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	170.5433
Water heating fuel used	1565.2643 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	239.2771 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (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	2533.6401 (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	729.0987	0.1571	114.5233	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1565.2643	0.1409	220.5508	(264)
Space and water heating			335.0741	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	239.2771	0.1443	34.5351	(268)
Total CO2, kg/year			369.6092	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6200	(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	729.0987	1.5815	1153.0428	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1565.2643	1.5210	2380.7814	(278)
Space and water heating			3533.8242	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	239.2771	1.5338	367.0112	(282)
Total Primary energy kWh/year			3900.8354	(286)
Dwelling Primary energy Rate (DPER)			48.7600	(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	40.0000 (1b)	x	2.4000 (2b)	=	96.0000 (1b)	-
First floor	40.0000 (1c)	x	2.4000 (2c)	=	96.0000 (1c)	-
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	192.0000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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) =	0.1562 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4062 (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) =	0.3453 (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	0.4403	0.4316	0.4230	0.3798	0.3712	0.3280	0.3280	0.3194	0.3453	0.3712	0.3885	0.4057	(22b)
Effective ac	0.5969	0.5932	0.5895	0.5721	0.5689	0.5538	0.5538	0.5510	0.5596	0.5689	0.5755	0.5823	(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 Opening Type (Uw = 1.20)			14.7300	1.1450	16.8664			(27)
Heatloss Floor 1			40.0000	0.1300	5.2000			(28a)
External Wall 1	86.4000	14.7300	71.6700	0.1800	12.9006			(29a)
External Roof 1	40.0000		40.0000	0.1100	4.4000			(30)
Total net area of external elements Aum(A, m2)			166.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.3670			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 229.7163 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	18.0000	0.1600	2.8800
E6 Intermediate floor within a dwelling	18.0000	0.0000	0.0000
E16 Corner (normal)	9.6000	0.0900	0.8640
E18 Party wall between dwellings	9.6000	0.0600	0.5760
E2 Other lintels (including other steel lintels)	12.6600	0.0500	0.6330
E3 Sill	9.5100	0.0500	0.4755
E4 Jamb	36.0000	0.0500	1.8000
E11 Eaves (insulation at rafter level)	10.0000	0.0400	0.4000
E12 Gable (insulation at ceiling level)	18.0000	0.0600	1.0800

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.7085 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	48.0755 (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	37.8209	37.5824	37.3487	36.2508	36.0454	35.0892	35.0892	34.9122	35.4575	36.0454	36.4610	36.8954	(38)
Heat transfer coeff	85.8964	85.6579	85.4242	84.3263	84.1209	83.1647	83.1647	82.9877	83.5331	84.1209	84.5365	84.9709	(39)
Average = Sum(39)m / 12 =												84.3254	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0737	1.0707	1.0678	1.0541	1.0515	1.0396	1.0396	1.0373	1.0442	1.0515	1.0567	1.0621	(40)
HLP (average)												1.0541	
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 2.4629 (42)

Hot water usage for mixer showers

65.5138	64.5292	63.0946	60.3496	58.3238	56.0648	54.7807	56.2045	57.7653	60.1909	62.9948	65.2628 (42a)

Hot water usage for baths

28.2963	27.8761	27.2843	26.1931	25.3761	24.4701	23.9808	24.5684	25.2083	26.1777	27.2913	28.2006 (42b)

Hot water usage for other uses

39.8522	38.4030	36.9538	35.5047	34.0555	32.6063	32.6063	34.0555	35.5047	36.9538	38.4030	39.8522 (42c)

Average daily hot water use (litres/day) 122.8659 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	133.6623	130.8083	127.3327	122.0474	117.7554	113.1412	111.3678	114.8284	118.4782	123.3223	128.6891	133.3156	(44)
Energy conte	211.6883	186.2693	195.7056	167.0767	158.5214	139.1203	134.6897	142.1816	146.0955	167.3473	183.3412	208.7400	(45)
Energy content (annual)										Total = Sum(45)m =		2040.7768	
Distribution loss (46)m = 0.15 x (45)m													
	31.7533	27.9404	29.3558	25.0615	23.7782	20.8680	20.2035	21.3272	21.9143	25.1021	27.5012	31.3110	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	258.2832	228.3550	242.3005	212.1686	205.1163	184.2121	181.2846	188.7765	191.1873	213.9422	228.4330	255.3349	(62)
WWHRS	-29.9502	-26.4882	-27.7369	-22.9672	-21.4046	-18.3161	-17.1684	-18.2569	-18.9505	-22.3406	-25.3092	-29.3955	(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													
	228.3331	201.8668	214.5636	189.2013	183.7117	165.8960	164.1162	170.5196	172.2368	191.6015	203.1238	225.9393	(64)
										Total per year (kWh/year) = Sum(64)m =		2311.1097	(64)
12Total per year (kWh/year)												2311	(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													
	107.6623	95.6031	102.3480	91.6265	89.9843	82.3310	82.0602	84.5513	84.6502	92.9189	97.0344	106.6820	(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	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	112.6506	124.7203	112.6506	116.4056	112.6506	116.4056	112.6506	112.6506	116.4056	112.6506	116.4056	112.6506	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	(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)													
	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	(71)
Water heating gains (Table 5)													
	144.7074	142.2665	137.5645	127.2590	120.9466	114.3486	110.2960	113.6442	117.5697	124.8910	134.7700	143.3897	(72)
Total internal gains													
	539.7414	551.6474	529.1375	510.3709	484.8830	464.5469	447.0570	448.1281	461.5468	480.3291	509.3837	528.7415	(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	3.9500	10.6334	0.6300	0.7000	0.7700	12.8363	(74)
East	3.8000	19.6403	0.6300	0.7000	0.7700	22.8088	(76)
West	6.9800	19.6403	0.6300	0.7000	0.7700	41.8962	(80)

Solar gains	77.5413	151.1076	250.1378	370.9726	462.7795	477.9630	453.2623	383.4308	292.5581	179.3948	96.5148	63.9112	(83)
Total gains	617.2828	702.7550	779.2753	881.3436	947.6625	942.5098	900.3193	831.5589	754.1049	659.7238	605.8985	592.6528	(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	59.4298	59.5952	59.7583	60.5363	60.6841	61.3818	61.3818	61.5128	61.1112	60.6841	60.3858	60.0771	
alpha	4.9620	4.9730	4.9839	5.0358	5.0456	5.0921	5.0921	5.1009	5.0741	5.0456	5.0257	5.0051	
util living area													
	0.9913	0.9825	0.9607	0.8890	0.7458	0.5509	0.4040	0.4543	0.7071	0.9277	0.9823	0.9928	(86)
MIT	19.8045	19.9986	20.2870	20.6544	20.8896	20.9809	20.9967	20.9943	20.9369	20.6163	20.1544	19.7776	(87)
Th 2	20.0224	20.0248	20.0272	20.0385	20.0406	20.0505	20.0505	20.0523	20.0467	20.0406	20.0363	20.0319	(88)
util rest of house													
	0.9887	0.9776	0.9495	0.8597	0.6900	0.4749	0.3181	0.3631	0.6294	0.9015	0.9764	0.9907	(89)
MIT 2	18.6420	18.8892	19.2512	19.6986	19.9512	20.0397	20.0494	20.0502	20.0052	19.6671	19.0970	18.6148	(90)
Living area fraction										fLA = Living area / (4) =		0.2250	(91)
MIT	18.9035	19.1388	19.4843	19.9136	20.1624	20.2515	20.2626	20.2626	20.2148	19.8807	19.3349	18.8764	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9035	19.1388	19.4843	19.9136	20.1624	20.2515	20.2626	20.2626	20.2148	19.8807	19.3349	18.8764	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9847	0.9716	0.9417	0.8554	0.6975	0.4913	0.3374	0.3836	0.6439	0.8962	0.9706	0.9872	(94)
Useful gains	607.8507	682.8166	733.8820	753.8819	661.0344	463.0920	303.7863	319.0230	485.5949	591.2733	588.1128	585.0553	(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													
	1254.3921	1219.6670	1109.1700	928.7381	711.8629	470.0069	304.5958	320.5505	510.7880	780.6974	1034.2956	1247.0687	(97)
Space heating kWh													
	481.0268	360.7634	279.2143	125.8965	37.8164	0.0000	0.0000	0.0000	0.0000	140.9316	321.2516	492.5379	(98a)
Space heating requirement - total per year (kWh/year)												2239.4385	
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													
	481.0268	360.7634	279.2143	125.8965	37.8164	0.0000	0.0000	0.0000	0.0000	140.9316	321.2516	492.5379	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2239.4385	
Space heating per m2											(98c) / (4) =	27.9930	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.3000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	481.0268	360.7634	279.2143	125.8965	37.8164	0.0000	0.0000	0.0000	0.0000	140.9316	321.2516	492.5379	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	521.1558	390.8596	302.5074	136.3992	40.9712	0.0000	0.0000	0.0000	0.0000	152.6886	348.0516	533.6272	(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													
	228.3331	201.8668	214.5636	189.2013	183.7117	165.8960	164.1162	170.5196	172.2368	191.6015	203.1238	225.9393	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.6892	85.3464	84.6514	83.1679	81.2050	79.8000	79.8000	79.8000	79.8000	83.3816	85.0829	85.7584	(217)
Fuel for water heating, kWh/month													
	266.4665	236.5263	253.4672	227.4933	226.2321	207.8898	205.6593	213.6837	215.8355	229.7889	238.7363	263.4602	(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	23.4066	18.7776	16.9072	12.3869	9.5680	7.8171	8.7283	11.3453	14.7364	19.3350	21.8389	24.0571	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.2699	-52.4658	-75.3087	-84.5553	-91.0790	-84.9747	-83.9148	-79.2586	-71.0385	-59.9237	-40.9422	-32.2304	(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	-21.2980	-44.7760	-88.9470	-133.5259	-176.4948	-177.3186	-175.2407	-148.4127	-108.8249	-64.0234	-28.4321	-16.8448	(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												2426.2606	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater		79.8000
Water heating fuel used		2785.2390 (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)		188.9044 (232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation		-1977.1002 (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		3509.3039 (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	2426.2606	0.2100	509.5147	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2785.2390	0.2100	584.9002	(264)
Space and water heating			1094.4149	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	188.9044	0.1443	27.2647	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-792.9615	0.1346	-106.7462	
PV Unit electricity exported	-1184.1387	0.1259	-149.0945	
Total			-255.8407	(269)
Total CO2, kg/year			877.7682	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9700	(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	2426.2606	1.1300	2741.6745	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2785.2390	1.1300	3147.3201	(278)
Space and water heating			5888.9946	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	188.9044	1.5338	289.7479	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-792.9615	1.4975	-1187.4788	
PV Unit electricity exported	-1184.1387	0.4622	-547.2802	
Total			-1734.7590	(283)
Total Primary energy kWh/year			4574.0843	(286)
Target Primary Energy Rate (TPER)			57.1800	(287)