Full SAP Calculation Printout

Property Reference	Apartment 2	**Issued on Date**	21/12/2023
Assessment Reference	Apartment 2 Be Green	**Prop Type Ref**	Apartment 1
Property	Apartment 1, 95, Avenue Road, London, NW8 6HY		

SAP Rating	70 C	**DER**	30.27	**TER**	18.38
Environmental	74 C	**% DER < TER**			-64.69
CO_2 Emissions (t/year)	2.34	**DFEE**	73.31	**TFEE**	36.94
Compliance Check	See BREL	**% DFEE < TFEE**			-98.48
% DPER < TPER	-70.09	**DPER**	168.27	**TPER**	98.93

Assessor Details	Mr. Graham Suttill	**Assessor ID**	P035-0001
Client	Carnell Warren Associates Ltd, Wendy Warren		

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	91.1600	(1b)	x 2.5100	(2b) =	228.8116	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		228.8116	(5)

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2. Ventilation rate

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

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		6.0000 (17)
Infiltration rate		0.3000 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2100 (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	0.2677	0.2625	0.2573	0.2310	0.2257	0.1995	0.1995	0.1943	0.2100	0.2257	0.2362	0.2467	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		79.2000 (23c)

Effective ac	0.3717	0.3665	0.3613	0.3350	0.3297	0.3035	0.3035	0.2983	0.3140	0.3297	0.3402	0.3508	(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	
Windows (Uw = 1.40)			12.0300	1.3258	15.9489			(27)
Glazed Doors (Uw = 1.40)			18.2200	1.3258	24.1553			(27)
RL			1.1500	1.3258	1.5246			(27a)
Basement Floor			91.1600	0.2500	22.7900	110.0000	10027.6000	(28a)
Retaining Walls	21.8400		21.8400	0.3000	6.5520	9.0000	196.5600	(29a)
Wall to Lightwells	59.2100	27.4600	31.7500	0.3000	9.5250	9.0000	285.7500	(29a)
New External Wall	4.2100	2.7900	1.4200	0.1800	0.2556	150.0000	213.0000	(29a)
Flat Roof	3.4400	1.1500	2.2900	0.1500	0.3435	9.0000	20.6100	(30)
Total net area of external elements Aum(A, m2)			179.8600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		81.0949			(33)
Wall to Corridor			30.0100	0.0000	0.0000	20.0000	600.2000	(32)
Party Ceiling 1			87.7200			30.0000	2631.6000	(32b)
Internal Wall 1			163.0800			75.0000	12231.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	26206.3200 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												287.4761	(35)
Thermal bridges (Default value 0.200 * total exposed area)												35.9720	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	117.0669	(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	28.0700	27.6736	27.2772	25.2951	24.8987	22.9166	22.9166	22.5202	23.7095	24.8987	25.6915	26.4844	(38)
Heat transfer coeff	145.1369	144.7405	144.3441	142.3620	141.9656	139.9835	139.9835	139.5871	140.7763	141.9656	142.7584	143.5513	(39)
Average = Sum(39)m / 12 =												142.2629	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5921	1.5878	1.5834	1.5617	1.5573	1.5356	1.5356	1.5312	1.5443	1.5573	1.5660	1.5747	(40)
HLP (average)												1.5606	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6413	(42)
Hot water usage for mixer showers	77.0683	75.9101	74.2224	70.9933	68.6103	65.9527	64.4422	66.1171	67.9532	70.8065	74.1050	76.7730	(42a)
Hot water usage for baths	29.5827	29.1433	28.5246	27.3839	26.5297	25.5826	25.0710	25.6853	26.3542	27.3677	28.5320	29.4827	(42b)
Hot water usage for other uses	41.6792	40.1636	38.6480	37.1324	35.6168	34.1012	34.1012	35.6168	37.1324	38.6480	40.1636	41.6792	(42c)
Average daily hot water use (litres/day)												136.3724	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.3302	145.2170	141.3950	135.5095	130.7567	125.6365	123.6143	127.4192	131.4398	136.8223	142.8006	147.9349	(44)
Energy conte	234.9187	206.7871	217.3189	185.5058	176.0237	154.4847	149.5008	157.7716	162.0784	185.6665	203.4456	231.6303	(45)
Energy content (annual)											Total = Sum(45)m =	2265.1323	
Distribution loss (46)m = 0.15 x (45)m	35.2378	31.0181	32.5978	27.8259	26.4036	23.1727	22.4251	23.6657	24.3118	27.8500	30.5168	34.7445	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.0800	(55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	291.6611	258.0383	274.0613	240.4178	232.7661	209.3967	206.2432	214.5140	216.9904	242.4089	258.3576	288.3727	(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	291.6611	258.0383	274.0613	240.4178	232.7661	209.3967	206.2432	214.5140	216.9904	242.4089	258.3576	288.3727	(64)
										Total per year (kWh/year) = Sum(64)m =		2933.2283	(64)
12Total per year (kWh/year)												2933	(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	123.5044	109.7577	117.6524	105.6103	103.9218	95.2958	95.1029	97.8530	97.8207	107.1280	111.5753	122.4110	(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	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	121.6555	134.6901	121.6555	125.7107	121.6555	125.7107	121.6555	121.6555	125.7107	121.6555	125.7107	121.6555	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.1957	243.6986	237.3914	223.9643	207.0150	191.0851	180.4429	177.9400	184.2471	197.6742	214.6236	230.5535	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	(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)	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	(71)
Water heating gains (Table 5)	166.0005	163.3299	158.1350	146.6809	139.6798	132.3552	127.8265	131.5228	135.8621	143.9893	154.9657	164.5309	(72)
Total internal gains	591.4708	604.3375	579.8010	558.9750	530.9694	511.7700	492.5440	493.7374	508.4389	525.9381	557.9189	579.3589	(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	2.2500	10.6334	0.4000	0.7000	0.5400	3.2557	(74)
South	9.7800	46.7521	0.4000	0.7000	0.5400	62.2206	(78)
North	3.6100	10.6334	0.4000	0.7000	0.5400	5.2236	(74)
West	14.6100	19.6403	0.4000	0.7000	0.5400	39.0474	(80)
East	1.1500	26.0000	0.4000	0.7000	1.0000	7.5348	(82)

Solar gains	117.2821	210.1399	310.9555	417.8705	492.9425	499.0332	477.1985	420.5713	348.3342	238.9634	142.4639	99.0296	(83)
Total gains	708.7529	814.4774	890.7565	976.8455	1023.9120	1010.8033	969.7425	914.3087	856.7731	764.9015	700.3828	678.3885	(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, nil,m (see Table 9a)													
tau	50.1563	50.2937	50.4318	51.1340	51.2767	52.0028	52.0028	52.1505	51.7099	51.2767	50.9920	50.7103	
alpha	4.3438	4.3529	4.3621	4.4089	4.4184	4.4669	4.4669	4.4767	4.4473	4.4184	4.3995	4.3807	
util living area	0.9966	0.9933	0.9860	0.9628	0.9024	0.7646	0.6019	0.6521	0.8637	0.9729	0.9934	0.9972	(86)
MIT	19.3157	19.5070	19.8072	20.2294	20.6092	20.8783	20.9681	20.9545	20.7714	20.2780	19.7312	19.2938	(87)
Th 2	19.6191	19.6223	19.6255	19.6416	19.6448	19.6609	19.6609	19.6642	19.6545	19.6448	19.6383	19.6319	(88)
util rest of house	0.9952	0.9906	0.9800	0.9451	0.8526	0.6509	0.4354	0.4870	0.7773	0.9564	0.9901	0.9961	(89)
MIT 2	17.7088	17.9549	18.3381	18.8754	19.3223	19.5967	19.6529	19.6510	19.5074	18.9458	18.2530	17.6894	(90)
Living area fraction										fLA = Living area / (4) =		0.3214	(91)
MIT	18.2253	18.4537	18.8102	19.3106	19.7359	20.0087	20.0756	20.0700	19.9137	19.3740	18.7281	18.2050	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2253	18.4537	18.8102	19.3106	19.7359	20.0087	20.0756	20.0700	19.9137	19.3740	18.7281	18.2050	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9871	0.9749	0.9394	0.8566	0.6839	0.4900	0.5411	0.7973	0.9518	0.9869	0.9943	(94)
Useful gains	703.8801	804.0052	868.3582	917.6402	877.1313	691.2990	475.1363	494.7042	683.0692	728.0488	691.2069	674.5240	(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	2021.0704	1961.7754	1776.9116	1482.0713	1140.8249	757.1234	486.5305	512.2834	818.4314	1245.6018	1660.0087	2010.4421	(97)
Space heating kWh	979.9895	778.0216	675.9637	406.3904	196.1881	0.0000	0.0000	0.0000	0.0000	385.0595	697.5373	993.9231	(98a)
Space heating requirement - total per year (kWh/year)												5113.0732	
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	979.9895	778.0216	675.9637	406.3904	196.1881	0.0000	0.0000	0.0000	0.0000	385.0595	697.5373	993.9231	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5113.0732	
Space heating per m2											(98c) / (4) =	56.0890	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1315.8450	1035.8780	1060.8619	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7641	0.8468	0.8136	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1005.4367	877.2008	863.0777	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1164.8826	1118.0196	1050.9801	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	114.8011	179.1691	139.7994	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		0.6582	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	18.8900	29.4815	23.0034	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												71.3750	(107)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Boilers-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	979.9895	778.0216	675.9637	406.3904	196.1881	0.0000	0.0000	0.0000	0.0000	385.0595	697.5373	993.9231	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.50													
307a	1469.9843	1167.0324	1013.9455	609.5857	294.2821	0.0000	0.0000	0.0000	0.0000	577.5892	1046.3060	1490.8846	
Space heating requirement													
	1469.9843	1167.0324	1013.9455	609.5857	294.2821	0.0000	0.0000	0.0000	0.0000	577.5892	1046.3060	1490.8846	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	291.6611	258.0383	274.0613	240.4178	232.7661	209.3967	206.2432	214.5140	216.9904	242.4089	258.3576	288.3727	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.50													
310a	437.4917	387.0575	411.0919	360.6267	349.1492	314.0951	309.3649	321.7711	325.4857	363.6134	387.5364	432.5590	
Water heating fuel													
	437.4917	387.0575	411.0919	360.6267	349.1492	314.0951	309.3649	321.7711	325.4857	363.6134	387.5364	432.5590	(310)
Cooling System Energy Efficiency Ratio												2.6000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	7.2654	11.3391	8.8475	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	22.5706	20.3864	22.5706	21.8425	22.5706	21.8425	22.5706	22.5706	21.8425	22.5706	21.8425	22.5706	(331)
Lighting	28.6349	22.9720	20.6837	15.1538	11.7052	9.5633	10.6779	13.8795	18.0281	23.6539	26.7170	29.4308	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												7669.6099	(307)

Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4399.8424	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	76.6961	(313)
Space cooling fuel	27.4519	(321)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9520)		
mechanical ventilation fans (SFP = 0.9520)	265.7509	(330a)
Total electricity for the above, kWh/year	265.7509	(331)
Electricity for lighting (calculated in Appendix L)	231.1003	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	12593.7554	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			95.0000	(367)
Space and Water heating from Boilers	12704.6866	0.2100	1695.3874	(367)
Electrical energy for heat distribution (space & water)	76.6961	0.0000	18.0709	(372)
Overall CO2 factor for heat network			0.2225	(386)
Total CO2 associated with community systems			2686.0551	(373)
Space and water heating			2686.0551	(376)
Space cooling	27.4519	0.1137	3.1214	(377)
Pumps, fans and electric keep-hot	265.7509	0.1387	36.8629	(378)
Energy for lighting	231.1003	0.1443	33.3549	(379)
Total CO2, kg/year			2759.3943	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			30.2700	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Boilers			95.0000	(467a)
Space and Water heating from Boilers	12704.6866	1.1300	9122.7991	(467)
Electrical energy for heat distribution (space & water)	76.6961	0.0000	187.5691	(472)
Overall CO2 factor for heat network			1.2050	(486)
Total CO2 associated with community systems			14543.8650	(473)
Space and water heating			14543.8650	(476)
Space cooling	27.4519	1.4192	38.9590	(477)
Pumps, fans and electric keep-hot	265.7509	1.5128	402.0280	(478)
Energy for lighting	231.1003	1.5338	354.4693	(479)
Total Primary energy kWh/year			15339.3213	(483)
Dwelling Primary energy Rate (DPER)			168.2700	(484)

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		91.1600 (1b)	x	2.5100 (2b)	=	228.8116	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.1600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	228.8116	(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) =	0.1311	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3811	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2668	(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													
	0.3401	0.3335	0.3268	0.2935	0.2868	0.2534	0.2534	0.2468	0.2668	0.2868	0.3001	0.3135	(22b)
Effective ac	0.5578	0.5556	0.5534	0.5431	0.5411	0.5321	0.5321	0.5304	0.5356	0.5411	0.5450	0.5491	(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)			21.9500	1.1450	25.1336			(27)
RL			0.8300	2.0221	1.6783			(27a)
Basement Floor			91.1600	0.1300	11.8508			(28a)
Retaining Walls	21.8400		21.8400	0.1800	3.9312			(29a)
Wall to Lightwells	59.2100	19.9300	39.2800	0.1800	7.0704			(29a)
New External Wall	4.2100	2.0200	2.1900	0.1800	0.3942			(29a)
Flat Roof	3.4400	0.8300	2.6100	0.1100	0.2871			(30)
Total net area of external elements Aum(A, m2)			179.8600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.3456			(33)
Wall to Corridor			30.0100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	297.0987	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	8.9930	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	59.3386	(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	42.1219	41.9523	41.7861	41.0052	40.8591	40.1789	40.1789	40.0530	40.4409	40.8591	41.1546	41.4636	(38)
Heat transfer coeff													
	101.4605	101.2909	101.1247	100.3438	100.1976	99.5175	99.5175	99.3916	99.7795	100.1976	100.4932	100.8022	(39)
Average = Sum(39)m / 12 =												100.3431	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1130	1.1111	1.1093	1.1007	1.0991	1.0917	1.0917	1.0903	1.0946	1.0991	1.1024	1.1058	(40)
HLP (average)												1.1007	
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	2.6413	(42)

Hot water usage for mixer showers

68.5051	67.4756	65.9754	63.1051	60.9869	58.6247	57.2820	58.7708	60.4028	62.9391	65.8711	68.2427	(42a)

Hot water usage for baths

29.5827	29.1433	28.5246	27.3839	26.5297	25.5826	25.0710	25.6853	26.3542	27.3677	28.5320	29.4827	(42b)

Hot water usage for other uses

41.6792	40.1636	38.6480	37.1324	35.6168	34.1012	34.1012	35.6168	37.1324	38.6480	40.1636	41.6792	(42c)

Average daily hot water use (litres/day)	128.4774	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	139.7670	136.7826	133.1481	127.6214	123.1334	118.3084	116.4541	120.0729	123.8895	128.9549	134.5667	139.4045	(44)
Energy conte	221.3568	194.7766	204.6437	174.7073	165.7612	145.4740	140.8411	148.6753	152.7681	174.9905	191.7149	218.2738	(45)
Energy content (annual)										Total = Sum(45)m =		2133.9834	
Distribution loss (46)m = 0.15 x (45)m													
	33.2035	29.2165	30.6965	26.2061	24.8642	21.8211	21.1262	22.3013	22.9152	26.2486	28.7572	32.7411	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4400	(48)
Temperature factor from Table 2b												1.0000	(49)
Enter (49) or (54) in (55)												1.4400	(55)
Total storage loss													
	44.6400	40.3200	44.6400	43.2000	44.6400	43.2000	44.6400	44.6400	43.2000	44.6400	43.2000	44.6400	(56)
If cylinder contains dedicated solar storage													
	44.6400	40.3200	44.6400	43.2000	44.6400	43.2000	44.6400	44.6400	43.2000	44.6400	43.2000	44.6400	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	265.9968	235.0966	249.2837	217.9073	210.4012	188.6740	185.4811	193.3153	195.9681	219.6305	234.9149	262.9138	(62)
WWHRS	-31.3177	-27.6976	-29.0033	-24.0159	-22.3820	-19.1524	-17.9523	-19.0905	-19.8158	-23.3607	-26.4648	-30.7377	(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													
	234.6791	207.3989	220.2803	193.8914	188.0192	169.5216	167.5288	174.2248	176.1523	196.2699	208.4501	232.1761	(64)
										Total per year (kWh/year) = Sum(64)m =		2368.5926	(64)
12Total per year (kWh/year)												2369	(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													
	109.3131	97.0192	103.7560	92.6502	90.8276	82.9301	82.5417	85.1465	85.3554	93.8964	98.3052	108.2880	(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	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.2043	135.2976	122.2043	126.2778	122.2043	126.2778	122.2043	122.2043	126.2778	122.2043	126.2778	122.2043	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	241.1957	243.6986	237.3914	223.9643	207.0150	191.0851	180.4429	177.9400	184.2471	197.6742	214.6236	230.5535	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	(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)													
	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	(71)
Water heating gains (Table 5)													
	146.9263	144.3738	139.4570	128.6808	122.0801	115.1807	110.9431	114.4443	118.5492	126.2048	136.5350	145.5484	(72)

Total internal gains

	572.9453	585.9890	561.6718	541.5420	513.9185	495.1626	476.2093	477.2076	491.6931	508.7024	540.0554	560.9253 (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	4.2500	10.6334	0.6300	0.7000	0.5400	9.6858	(74)
South	7.1000	46.7521	0.6300	0.7000	0.5400	71.1433	(78)
West	10.6000	19.6403	0.6300	0.7000	0.5400	44.6198	(80)
East	0.8300	26.0000	0.6300	0.7000	1.0000	8.5651	(82)

Solar gains	134.0140	240.0994	355.2442	477.3282	563.0387	569.9790	545.0468	480.3961	397.9260	273.0198	162.7845	113.1601	(83)
Total gains	706.9593	826.0884	916.9160	1018.8701	1076.9572	1065.1416	1021.2561	957.6037	889.6191	781.7221	702.8399	674.0854	(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	74.1490	74.2732	74.3953	74.9743	75.0836	75.5967	75.5967	75.6925	75.3983	75.0836	74.8628	74.6333	
alpha	5.9433	5.9515	5.9597	5.9983	6.0056	6.0398	6.0398	6.0462	6.0266	6.0056	5.9909	5.9756	
util living area	0.9968	0.9913	0.9763	0.9205	0.7885	0.5869	0.4273	0.4746	0.7292	0.9487	0.9918	0.9975	(86)
MIT	19.9811	20.1639	20.4116	20.7150	20.9148	20.9878	20.9984	20.9972	20.9589	20.6900	20.2783	19.9476	(87)
Th 2	19.9902	19.9918	19.9932	20.0002	20.0015	20.0076	20.0076	20.0088	20.0053	20.0015	19.9989	19.9961	(88)
util rest of house	0.9955	0.9880	0.9673	0.8923	0.7278	0.5012	0.3318	0.3739	0.6426	0.9239	0.9881	0.9966	(89)
MIT 2	18.8169	19.0503	19.3619	19.7293	19.9380	20.0019	20.0072	20.0080	19.9820	19.7105	19.2026	18.7787	(90)
Living area fraction									fLA = Living area / (4) =			0.3214	(91)
MIT	19.1911	19.4082	19.6993	20.0461	20.2519	20.3188	20.3258	20.3259	20.2960	20.0253	19.5483	19.1544	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1911	19.4082	19.6993	20.0461	20.2519	20.3188	20.3258	20.3259	20.2960	20.0253	19.5483	19.1544	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9941	0.9855	0.9640	0.8938	0.7441	0.5286	0.3626	0.4064	0.6693	0.9246	0.9859	0.9955	(94)
Useful gains	702.8161	814.1339	883.8707	910.6887	801.3108	563.0290	370.2655	389.1855	595.4248	722.7793	692.9266	671.0354	(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	1510.8577	1469.5495	1334.7748	1118.4454	856.8836	569.1179	370.7855	390.2027	618.2318	944.3975	1250.9746	1507.4351	(97)
Space heating kWh	601.1830	440.4393	335.4726	149.5849	41.3462	0.0000	0.0000	0.0000	0.0000	164.8840	401.7946	622.2813	(98a)
Space heating requirement - total per year (kWh/year)												2756.9859	
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	601.1830	440.4393	335.4726	149.5849	41.3462	0.0000	0.0000	0.0000	0.0000	164.8840	401.7946	622.2813	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2756.9859	
Space heating per m2											(98c) / (4) =	30.2434	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Boilers-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	601.1830	440.4393	335.4726	149.5849	41.3462	0.0000	0.0000	0.0000	0.0000	164.8840	401.7946	622.2813	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.50													
307a	901.7745	660.6590	503.2090	224.3773	62.0193	0.0000	0.0000	0.0000	0.0000	247.3259	602.6918	933.4220	
Space heating requirement	901.7745	660.6590	503.2090	224.3773	62.0193	0.0000	0.0000	0.0000	0.0000	247.3259	602.6918	933.4220	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	234.6791	207.3989	220.2803	193.8914	188.0192	169.5216	167.5288	174.2248	176.1523	196.2699	208.4501	232.1761	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.50													
310a	352.0187	311.0984	330.4205	290.8371	282.0288	254.2823	251.2932	261.3372	264.2284	294.4048	312.6752	348.2641	
Water heating fuel	352.0187	311.0984	330.4205	290.8371	282.0288	254.2823	251.2932	261.3372	264.2284	294.4048	312.6752	348.2641	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
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	(331)
Lighting	25.3916	20.3701	18.3410	13.4374	10.3795	8.4801	9.4685	12.3075	15.9862	20.9748	23.6910	26.0974	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-11.9395	-18.3148	-28.6072	-35.0297	-40.3449	-38.5895	-38.0983	-34.6583	-29.1099	-22.1235	-13.6347	-10.1558	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	-2.8912	-6.3090	-12.9860	-20.1933	-27.4107	-27.8290	-27.5256	-22.9931	-16.4355	-9.2627	-3.9324	-2.2712	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)

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

(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	4135.4788	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	3552.8888	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	41.3548	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(331)
Electricity for lighting (calculated in Appendix L)	204.9251	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-500.6457	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	7392.6470	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			95.0000	(367)
Space and Water heating from Boilers	8093.0186	0.2100	914.1585	(367)
Electrical energy for heat distribution (space & water)	41.3548	0.0000	11.4721	(372)
Overall CO2 factor for heat network			0.2225	(386)
Total CO2 associated with community systems			1711.0060	(373)
Space and water heating			1711.0060	(376)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(378)
Energy for lighting	204.9251	0.1443	29.5770	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-320.6061	0.1329	-42.6040	
PV Unit electricity exported	-180.0396	0.1249	-22.4822	
Total			-65.0862	(380)
Total CO2, kg/year			1675.4968	(383)
EPC Target Carbon Dioxide Emission Rate (TER)			18.3800	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Boilers			95.0000	(467a)
Space and Water heating from Boilers	8093.0186	1.1300	4919.0432	(467)
Electrical energy for heat distribution (space & water)	41.3548	0.0000	119.3320	(472)
Overall CO2 factor for heat network			1.2050	(486)
Total CO2 associated with community systems			9264.4430	(473)
Space and water heating			9264.4430	(476)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(478)
Energy for lighting	204.9251	1.5338	314.3210	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-320.6061	1.4910	-478.0320	
PV Unit electricity exported	-180.0396	0.4583	-82.5157	
Total			-560.5478	(480)
Total Primary energy kWh/year			9018.2162	(483)
Target Primary Energy Rate (TPER)			98.9300	(484)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		91.1600	(1b) x	2.5100	(2b) =	228.8116	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.1600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		228.8116	(5)

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2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) =	0.1311	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	6.0000	(17)
Infiltration rate	0.4311	(18)
Number of sides sheltered	4	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3018	(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	0.3848	0.3772	0.3697	0.3320	0.3244	0.2867	0.2867	0.2791	0.3018	0.3244	0.3395	0.3546	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5740	0.5711	0.5683	0.5551	0.5526	0.5411	0.5411	0.5390	0.5455	0.5526	0.5576	0.5629	(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	
Windows (Uw = 1.40)			12.0300	1.3258	15.9489			(27)
Glazed Doors (Uw = 1.40)			18.2200	1.3258	24.1553			(27)
RL			1.1500	1.3258	1.5246			(27a)
Basement Floor			91.1600	0.2500	22.7900	110.0000	10027.6000	(28a)
Retaining Walls	21.8400		21.8400	0.3000	6.5520	9.0000	196.5600	(29a)
Wall to Lightwells	59.2100	27.4600	31.7500	0.3000	9.5250	9.0000	285.7500	(29a)
New External Wall	4.2100	2.7900	1.4200	0.1800	0.2556	150.0000	213.0000	(29a)
Flat Roof	3.4400	1.1500	2.2900	0.1500	0.3435	9.0000	20.6100	(30)
Total net area of external elements Aum(A, m2)			179.8600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		81.0949			(33)
Wall to Corridor			30.0100	0.0000	0.0000	20.0000	600.2000	(32)
Party Ceiling 1			87.7200			40.0000	3508.8000	(32b)
Internal Wall 1			163.0800			75.0000	12231.0000	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	27083.5200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	297.0987	(35)
Thermal bridges (Default value 0.200 * total exposed area)	35.9720	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	117.0669	(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	43.3432	43.1262	42.9135	41.9142	41.7273	40.8569	40.8569	40.6958	41.1922	41.7273	42.1055	42.5009	(38)
Heat transfer coeff	160.4101	160.1931	159.9803	158.9811	158.7941	157.9238	157.9238	157.7627	158.2591	158.7941	159.1724	159.5678	(39)
Average = Sum(39)m / 12 =												158.9802	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7597	1.7573	1.7549	1.7440	1.7419	1.7324	1.7324	1.7306	1.7361	1.7419	1.7461	1.7504	(40)
HLP (average)												1.7440	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6413	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.5827	29.1433	28.5246	27.3839	26.5297	25.5826	25.0710	25.6853	26.3542	27.3677	28.5320	29.4827	(42b)
Hot water usage for other uses	41.6792	40.1636	38.6480	37.1324	35.6168	34.1012	34.1012	35.6168	37.1324	38.6480	40.1636	41.6792	(42c)
Average daily hot water use (litres/day)												65.3180	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2619	69.3069	67.1726	64.5163	62.1465	59.6837	59.1721	61.3021	63.4866	66.0157	68.6956	71.1619	(44)
Energy conte	112.8614	98.6922	103.2418	88.3196	83.6611	73.3881	71.5636	75.9048	78.2854	89.5827	97.8694	111.4223	(45)
Energy content (annual)										Total = Sum(45)m =		1084.7924	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	95.9322	83.8883	87.7556	75.0716	71.1120	62.3799	60.8290	64.5191	66.5426	76.1453	83.1890	94.7090	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	95.9322	83.8883	87.7556	75.0716	71.1120	62.3799	60.8290	64.5191	66.5426	76.1453	83.1890	94.7090	(64)
									Total per year (kWh/year) = Sum(64)m =			922.0736	(64)
12Total per year (kWh/year)												922	(64)
Electric shower(s)	54.8612	48.8818	53.3770	50.9370	51.8929	49.5007	51.1508	51.8929	50.9370	53.3770	52.3733	54.8612	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			624.0428	(64a)
Heat gains from water heating, kWh/month	37.6983	33.1925	35.2831	31.5022	30.7512	27.9702	27.9950	29.1030	29.3699	32.3806	33.8906	37.3925	(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	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	121.6555	134.6901	121.6555	125.7107	121.6555	125.7107	121.6555	121.6555	125.7107	121.6555	125.7107	121.6555	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	241.1957	243.6986	237.3914	223.9643	207.0150	191.0851	180.4429	177.9400	184.2471	197.6742	214.6236	230.5535	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	(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)													
	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	(71)
Water heating gains (Table 5)													
	50.6698	49.3936	47.4236	43.7530	41.3323	38.8474	37.6276	39.1169	40.7915	43.5223	47.0703	50.2588	(72)
Total internal gains													
	476.1401	490.4013	469.0896	456.0471	432.6218	418.2622	402.3450	401.3315	413.3684	425.4711	450.0235	465.0868	(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	2.2500	10.6334	0.4000	0.7000	0.5400	3.2557	(74)
South	9.7800	46.7521	0.4000	0.7000	0.5400	62.2206	(78)
North	3.6100	10.6334	0.4000	0.7000	0.5400	5.2236	(74)
West	14.6100	19.6403	0.4000	0.7000	0.5400	39.0474	(80)
East	1.1500	26.0000	0.4000	0.7000	1.0000	7.5348	(82)

Solar gains	117.2821	210.1399	310.9555	417.8705	492.9425	499.0332	477.1985	420.5713	348.3342	238.9634	142.4639	99.0296	(83)
Total gains	593.4222	700.5412	780.0451	873.9176	925.5644	917.2955	879.5436	821.9028	761.7026	664.4345	592.4874	564.1164	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	46.8998	46.9633	47.0258	47.3213	47.3771	47.6382	47.6382	47.6868	47.5372	47.3771	47.2645	47.1474	
alpha	4.1267	4.1309	4.1351	4.1548	4.1585	4.1759	4.1759	4.1791	4.1691	4.1585	4.1510	4.1432	
util living area													
	0.9985	0.9967	0.9926	0.9791	0.9412	0.8438	0.7021	0.7537	0.9202	0.9863	0.9969	0.9988	(86)
MIT	19.0528	19.2440	19.5567	20.0009	20.4333	20.7782	20.9275	20.9004	20.6338	20.0679	19.4834	19.0213	(87)
Th 2	19.4984	19.5001	19.5017	19.5095	19.5109	19.5177	19.5177	19.5190	19.5151	19.5109	19.5080	19.5049	(88)
util rest of house													
	0.9978	0.9952	0.9891	0.9675	0.9036	0.7345	0.5065	0.5684	0.8509	0.9767	0.9953	0.9982	(89)
MIT 2	17.7756	17.9674	18.2797	18.7227	19.1329	19.4213	19.5034	19.4956	19.3195	18.7941	18.2125	17.7489	(90)
Living area fraction									fLA = Living area / (4) =			0.3214	(91)
MIT	18.1862	18.3777	18.6901	19.1335	19.5509	19.8574	19.9611	19.9472	19.7419	19.2035	18.6210	18.1578	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1862	18.3777	18.6901	19.1335	19.5509	19.8574	19.9611	19.9472	19.7419	19.2035	18.6210	18.1578	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9969	0.9935	0.9863	0.9635	0.9049	0.7646	0.5722	0.6304	0.8648	0.9737	0.9938	0.9975	(94)
Useful gains	591.5654	696.0003	769.3629	842.0355	837.5313	701.3805	503.2369	518.1147	658.7065	646.9783	588.7916	562.6910	(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													
	2227.4793	2159.0329	1950.1830	1626.9345	1246.6737	830.2731	530.8006	559.6093	892.8891	1366.1922	1833.8246	2227.2208	(97)
Space heating kWh													
	1217.1199	983.1579	878.5302	565.1273	304.4020	0.0000	0.0000	0.0000	0.0000	535.0952	896.4238	1238.4101	(98a)
Space heating requirement - total per year (kWh/year)												6618.2664	
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													
	1217.1199	983.1579	878.5302	565.1273	304.4020	0.0000	0.0000	0.0000	0.0000	535.0952	896.4238	1238.4101	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6618.2664	
Space heating per m2											(98c) / (4) =	72.6006	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1484.4840	1168.6364	1198.9962	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6583	0.7515	0.7073	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	977.2348	878.2385	848.1004	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1070.7292	1027.1231	957.6674	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	67.3160	110.7701	81.5179	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	16.8290	27.6925	20.3795	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												64.9010	(107)
Energy for space heating												72.6006	(99)
Energy for space cooling												0.7119	(108)
Total												73.3125	(109)
Fabric Energy Efficiency (DFEE)												73.3	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	91.1600 (1b)	x	2.5100 (2b)	=	228.8116	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	228.8116	(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) =	0.1311	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3811	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2668	(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	0.3401	0.3335	0.3268	0.2935	0.2868	0.2534	0.2534	0.2468	0.2668	0.2868	0.3001	0.3135	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5578	0.5556	0.5534	0.5431	0.5411	0.5321	0.5321	0.5304	0.5356	0.5411	0.5450	0.5491	(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)			21.9500	1.1450	25.1336			(27)
RL			0.8300	2.0221	1.6783			(27a)
Basement Floor			91.1600	0.1300	11.8508			(28a)
Retaining Walls	21.8400		21.8400	0.1800	3.9312			(29a)
Wall to Lightwells	59.2100	19.9300	39.2800	0.1800	7.0704			(29a)
New External Wall	4.2100	2.0200	2.1900	0.1800	0.3942			(29a)
Flat Roof	3.4400	0.8300	2.6100	0.1100	0.2871			(30)
Total net area of external elements Aum(A, m2)			179.8600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.3456			(33)
Wall to Corridor			30.0100	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							297.0987	(35)
Thermal bridges (User defined value 0.050 * total exposed area)							8.9930	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		59.3386	(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	42.1219	41.9523	41.7861	41.0052	40.8591	40.1789	40.1789	40.0530	40.4409	40.8591	41.1546	41.4636	(38)
Heat transfer coeff	101.4605	101.2909	101.1247	100.3438	100.1976	99.5175	99.5175	99.3916	99.7795	100.1976	100.4932	100.8022	(39)
Average = Sum(39)m / 12 =												100.3431	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1130	1.1111	1.1093	1.1007	1.0991	1.0917	1.0917	1.0903	1.0946	1.0991	1.1024	1.1058	(40)
HLP (average)												1.1007	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6413	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.5827	29.1433	28.5246	27.3839	26.5297	25.5826	25.0710	25.6853	26.3542	27.3677	28.5320	29.4827	(42b)
Hot water usage for other uses	41.6792	40.1636	38.6480	37.1324	35.6168	34.1012	34.1012	35.6168	37.1324	38.6480	40.1636	41.6792	(42c)
Average daily hot water use (litres/day)												65.3180	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	71.2619	69.3069	67.1726	64.5163	62.1465	59.6837	59.1721	61.3021	63.4866	66.0157	68.6956	71.1619	(44)
Energy conte	112.8614	98.6922	103.2418	88.3196	83.6611	73.3881	71.5636	75.9048	78.2854	89.5827	97.8694	111.4223	(45)

Energy content (annual) Total = Sum(45)m = 1084.7924
Distribution loss (46)m = 0.15 x (45)m
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (46)
Water storage loss:
Total storage loss
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)
If cylinder contains dedicated solar storage
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)
Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)
Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)
Total heat required for water heating calculated for each month
95.9322 83.8883 87.7556 75.0716 71.1120 62.3799 60.8290 64.5191 66.5426 76.1453 83.1890 94.7090 (62)
WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)
PV diverter 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63b)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)
FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)
Output from w/h
95.9322 83.8883 87.7556 75.0716 71.1120 62.3799 60.8290 64.5191 66.5426 76.1453 83.1890 94.7090 (64)
Total per year (kWh/year) = Sum(64)m = 922.0736 (64)
12Total per year (kWh/year) 922 (64)
Electric shower(s)
54.8612 48.8818 53.3770 50.9370 51.8929 49.5007 51.1508 51.8929 50.9370 53.3770 52.3733 54.8612 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 624.0428 (64a)
Heat gains from water heating, kWh/month
37.6983 33.1925 35.2831 31.5022 30.7512 27.9702 27.9950 29.1030 29.3699 32.3806 33.8906 37.3925 (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	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	132.0634	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	122.2043	135.2976	122.2043	126.2778	122.2043	126.2778	122.2043	122.2043	126.2778	122.2043	126.2778	122.2043	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	241.1957	243.6986	237.3914	223.9643	207.0150	191.0851	180.4429	177.9400	184.2471	197.6742	214.6236	230.5535	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	36.2063	(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)													
	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	(71)
Water heating gains (Table 5)													
	50.6698	49.3936	47.4236	43.7530	41.3323	38.8474	37.6276	39.1169	40.7915	43.5223	47.0703	50.2588	(72)
Total internal gains													
	476.6889	491.0089	469.6384	456.6142	433.1706	418.8293	402.8938	401.8803	413.9355	426.0199	450.5906	465.6356	(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	4.2500	10.6334	0.6300	0.7000	0.5400	9.6858	(74)
South	7.1000	46.7521	0.6300	0.7000	0.5400	71.1433	(78)
West	10.6000	19.6403	0.6300	0.7000	0.5400	44.6198	(80)
East	0.8300	26.0000	0.6300	0.7000	1.0000	8.5651	(82)

Solar gains	134.0140	240.0994	355.2442	477.3282	563.0387	569.9790	545.0468	480.3961	397.9260	273.0198	162.7845	113.1601	(83)
Total gains	610.7029	731.1083	824.8826	933.9423	996.2094	988.8083	947.9406	882.2763	811.8614	699.0396	613.3752	578.7957	(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	74.1490	74.2732	74.3953	74.9743	75.0836	75.5967	75.5967	75.6925	75.3983	75.0836	74.8628	74.6333	
alpha	5.9433	5.9515	5.9597	5.9983	6.0056	6.0398	6.0398	6.0462	6.0266	6.0056	5.9909	5.9756	
util living area													
	0.9985	0.9953	0.9855	0.9431	0.8271	0.6273	0.4596	0.5135	0.7785	0.9681	0.9959	0.9989	(86)
MIT	19.8834	20.0700	20.3270	20.6561	20.8887	20.9828	20.9977	20.9957	20.9417	20.6231	20.1894	19.8504	(87)
Th 2	19.9902	19.9918	19.9932	20.0002	20.0015	20.0076	20.0076	20.0088	20.0053	20.0015	19.9989	19.9961	(88)
util rest of house													
	0.9979	0.9935	0.9797	0.9208	0.7699	0.5379	0.3573	0.4055	0.6935	0.9509	0.9940	0.9985	(89)
MIT 2	18.9787	19.1655	19.4201	19.7383	19.9347	20.0011	20.0072	20.0078	19.9783	19.7154	19.2909	18.9506	(90)
Living area fraction									fLA = Living area / (4) =			0.3214	(91)
MIT	19.2695	19.4562	19.7116	20.0333	20.2413	20.3166	20.3255	20.3253	20.2879	20.0072	19.5797	19.2398	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2695	19.4562	19.7116	20.0333	20.2413	20.3166	20.3255	20.3253	20.2879	20.0072	19.5797	19.2398	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9973	0.9922	0.9776	0.9216	0.7848	0.5665	0.3903	0.4404	0.7195	0.9511	0.9929	0.9980	(94)
Useful gains	609.0749	725.3962	806.4130	860.7411	781.8655	560.1548	369.9775	388.5722	584.1673	664.8234	609.0284	577.6599	(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													
	1518.8120	1474.4118	1336.0163	1117.1580	855.8207	568.9057	370.7570	390.1442	617.4273	942.5763	1254.1234	1516.0473	(97)
Space heating kWh													
	676.8443	503.3385	394.0248	184.6202	55.0226	0.0000	0.0000	0.0000	0.0000	206.6481	464.4684	698.1602	(98a)
Space heating requirement - total per year (kWh/year)												3183.1272	
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													
	676.8443	503.3385	394.0248	184.6202	55.0226	0.0000	0.0000	0.0000	0.0000	206.6481	464.4684	698.1602	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3183.1272	
Space heating per m2											(98c) / (4) =	34.9180	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	935.4646	736.4295	755.3758	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9324	0.9704	0.9546	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	872.2461	714.6666	721.0560	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1160.3957	1112.9073	1033.4421	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	207.4677	296.2910	232.4153	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	51.8669	74.0728	58.1038	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												184.0435	(107)
Energy for space heating												34.9180	(99)
Energy for space cooling												2.0189	(108)
Total												36.9369	(109)
Fabric Energy Efficiency (TFEE)												36.9	(109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	91.1600	(1b)	x 2.5100	(2b) =	228.8116	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		228.8116	(5)

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2. Ventilation rate

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	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		6.0000 (17)
Infiltration rate		0.3000 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2100 (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													
	0.2677	0.2625	0.2573	0.2310	0.2257	0.1995	0.1995	0.1943	0.2100	0.2257	0.2362	0.2467	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000	(23c)
Effective ac	0.3717	0.3665	0.3613	0.3350	0.3297	0.3035	0.3035	0.2983	0.3140	0.3297	0.3402	0.3508	(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	
Windows (Uw = 1.40)			12.0300	1.3258	15.9489			(27)
Glazed Doors (Uw = 1.40)			18.2200	1.3258	24.1553			(27)
RL			1.1500	1.3258	1.5246			(27a)
Basement Floor			91.1600	0.2500	22.7900	110.0000	10027.6000	(28a)
Retaining Walls	21.8400		21.8400	0.3000	6.5520	9.0000	196.5600	(29a)
Wall to Lightwells	59.2100	27.4600	31.7500	0.3000	9.5250	9.0000	285.7500	(29a)
New External Wall	4.2100	2.7900	1.4200	0.1800	0.2556	150.0000	213.0000	(29a)
Flat Roof	3.4400	1.1500	2.2900	0.1500	0.3435	9.0000	20.6100	(30)
Total net area of external elements Aum(A, m2)			179.8600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		81.0949			(33)
Wall to Corridor			30.0100	0.0000	0.0000	20.0000	600.2000	(32)
Party Ceiling 1			87.7200			40.0000	3508.8000	(32b)

Internal Wall 1					163.0800						75.0000	12231.0000	(32c)
Heat capacity Cm = Sum(A x k)									(28)...(30) + (32) + (32a)...(32e) =			27083.5200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												297.0987	(35)
Thermal bridges (Default value 0.200 * total exposed area)												35.9720	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	117.0669	(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	28.0700	27.6736	27.2772	25.2951	24.8987	22.9166	22.9166	22.5202	23.7095	24.8987	25.6915	26.4844	(38)
Heat transfer coeff	145.1369	144.7405	144.3441	142.3620	141.9656	139.9835	139.9835	139.5871	140.7763	141.9656	142.7584	143.5513	(39)
Average = Sum(39)m / 12 =												142.2629	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5921	1.5878	1.5834	1.5617	1.5573	1.5356	1.5356	1.5312	1.5443	1.5573	1.5660	1.5747	(40)
HLP (average)												1.5606	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6413	(42)
Hot water usage for mixer showers	77.0683	75.9101	74.2224	70.9933	68.6103	65.9527	64.4422	66.1171	67.9532	70.8065	74.1050	76.7730	(42a)
Hot water usage for baths	29.5827	29.1433	28.5246	27.3839	26.5297	25.5826	25.0710	25.6853	26.3542	27.3677	28.5320	29.4827	(42b)
Hot water usage for other uses	41.6792	40.1636	38.6480	37.1324	35.6168	34.1012	34.1012	35.6168	37.1324	38.6480	40.1636	41.6792	(42c)
Average daily hot water use (litres/day)												136.3724	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.3302	145.2170	141.3950	135.5095	130.7567	125.6365	123.6143	127.4192	131.4398	136.8223	142.8006	147.9349	(44)
Energy conte	234.9187	206.7871	217.3189	185.5058	176.0237	154.4847	149.5008	157.7716	162.0784	185.6665	203.4456	231.6303	(45)
Energy content (annual)										Total = Sum(45)m =		2265.1323	
Distribution loss (46)m = 0.15 x (45)m	35.2378	31.0181	32.5978	27.8259	26.4036	23.1727	22.4251	23.6657	24.3118	27.8500	30.5168	34.7445	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.0800	(55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	291.6611	258.0383	274.0613	240.4178	232.7661	209.3967	206.2432	214.5140	216.9904	242.4089	258.3576	288.3727	(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	291.6611	258.0383	274.0613	240.4178	232.7661	209.3967	206.2432	214.5140	216.9904	242.4089	258.3576	288.3727	(64)
										Total per year (kWh/year) = Sum(64)m =		2933.2283	(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	123.5044	109.7577	117.6524	105.6103	103.9218	95.2958	95.1029	97.8530	97.8207	107.1280	111.5753	122.4110	(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	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.7146	29.0568	23.6306	17.8899	13.3729	11.2900	12.1992	15.8570	21.2832	27.0240	31.5409	33.6239	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	359.9936	363.7292	354.3156	334.2751	308.9777	285.2016	269.3177	265.5821	274.9957	295.0362	320.3337	344.1097	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	(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)	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	(71)
Water heating gains (Table 5)	166.0005	163.3299	158.1350	146.6809	139.6798	132.3552	127.8265	131.5228	135.8621	143.9893	154.9657	164.5309	(72)
Total internal gains	665.0230	662.4301	642.3954	605.1602	568.3446	535.1610	515.6577	519.2762	538.4552	572.3636	613.1545	648.5787	(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	2.2500	10.6334	0.4000	0.7000	0.5400	3.2557	(74)
South	9.7800	46.7521	0.4000	0.7000	0.5400	62.2206	(78)
North	3.6100	10.6334	0.4000	0.7000	0.5400	5.2236	(74)
West	14.6100	19.6403	0.4000	0.7000	0.5400	39.0474	(80)
East	1.1500	26.0000	0.4000	0.7000	1.0000	7.5348	(82)

Solar gains	117.2821	210.1399	310.9555	417.8705	492.9425	499.0332	477.1985	420.5713	348.3342	238.9634	142.4639	99.0296	(83)
Total gains	782.3051	872.5701	953.3509	1023.0307	1061.2872	1034.1942	992.8562	939.8475	886.7894	811.3270	755.6183	747.6083	(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	51.8352	51.9772	52.1199	52.8456	52.9931	53.7435	53.7435	53.8961	53.4408	52.9931	52.6988	52.4078	
alpha	4.4557	4.4651	4.4747	4.5230	4.5329	4.5829	4.5829	4.5931	4.5627	4.5329	4.5133	4.4939	
util living area													
	0.9956	0.9922	0.9836	0.9592	0.8960	0.7574	0.5920	0.6405	0.8555	0.9690	0.9920	0.9964	(86)
MIT	19.4267	19.5983	19.8936	20.2878	20.6449	20.8914	20.9728	20.9613	20.7951	20.3364	19.8144	19.4017	(87)
Th 2	19.6191	19.6223	19.6255	19.6416	19.6448	19.6609	19.6609	19.6642	19.6545	19.6448	19.6383	19.6319	(88)
util rest of house													
	0.9938	0.9890	0.9765	0.9397	0.8433	0.6417	0.4263	0.4757	0.7651	0.9501	0.9881	0.9950	(89)
MIT 2	17.8445	18.0651	18.4413	18.9415	19.3574	19.6054	19.6545	19.6535	19.5266	19.0117	18.3529	17.8214	(90)
Living area fraction										fLA = Living area / (4) =		0.3214	(91)
MIT	18.3531	18.5579	18.9081	19.3742	19.7712	20.0188	20.0782	20.0739	19.9343	19.4375	18.8227	18.3293	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3531	18.5579	18.9081	19.3742	19.7712	20.0188	20.0782	20.0739	19.9343	19.4375	18.8227	18.3293	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9913	0.9853	0.9713	0.9347	0.8492	0.6761	0.4807	0.5298	0.7874	0.9462	0.9847	0.9929	(94)
Useful gains	775.5244	859.7760	925.9465	956.2699	901.2253	699.1822	477.2366	497.8980	698.2833	767.6730	744.0205	742.2637	(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													
	2039.6197	1976.8507	1791.0322	1491.1324	1145.8380	758.5381	486.8898	512.8221	821.3321	1254.6147	1673.5084	2028.2806	(97)
Space heating kWh													
	940.4869	750.6742	643.6238	385.1009	181.9919	0.0000	0.0000	0.0000	0.0000	362.2846	669.2313	956.7966	(98a)
Space heating requirement - total per year (kWh/year)												4890.1900	
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													
	940.4869	750.6742	643.6238	385.1009	181.9919	0.0000	0.0000	0.0000	0.0000	362.2846	669.2313	956.7966	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4890.1900	
Space heating per m2											(98c) / (4) =	53.6440	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1315.8450	1035.8780	1060.8619	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7675	0.8507	0.8173	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1009.9730	881.2335	867.0885	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1164.8826	1118.0196	1050.9801	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	111.5349	176.1688	136.8154	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		0.6582	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	18.3526	28.9878	22.5124	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												69.8529	(107)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Boilers-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	940.4869	750.6742	643.6238	385.1009	181.9919	0.0000	0.0000	0.0000	0.0000	362.2846	669.2313	956.7966	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.50													
307a	1410.7303	1126.0113	965.4356	577.6514	272.9878	0.0000	0.0000	0.0000	0.0000	543.4268	1003.8469	1435.1949	
Space heating requirement													
	1410.7303	1126.0113	965.4356	577.6514	272.9878	0.0000	0.0000	0.0000	0.0000	543.4268	1003.8469	1435.1949	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	291.6611	258.0383	274.0613	240.4178	232.7661	209.3967	206.2432	214.5140	216.9904	242.4089	258.3576	288.3727	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.50													
310a	437.4917	387.0575	411.0919	360.6267	349.1492	314.0951	309.3649	321.7711	325.4857	363.6134	387.5364	432.5590	
Water heating fuel													
	437.4917	387.0575	411.0919	360.6267	349.1492	314.0951	309.3649	321.7711	325.4857	363.6134	387.5364	432.5590	(310)
Cooling System Energy Efficiency Ratio												2.6000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	7.0587	11.1492	8.6586	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	22.5706	20.3864	22.5706	21.8425	22.5706	21.8425	22.5706	22.5706	21.8425	22.5706	21.8425	22.5706	(331)
Lighting	28.6349	22.9720	20.6837	15.1538	11.7052	9.5633	10.6779	13.8795	18.0281	23.6539	26.7170	29.4308	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	7335.2850	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4399.8424	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	73.3529	(313)
Space cooling fuel	26.8665	(321)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9520)		
mechanical ventilation fans (SFP = 0.9520)	265.7509	(330a)
Total electricity for the above, kWh/year	265.7509	(331)
Electricity for lighting (calculated in Appendix L)	231.1003	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	12258.8451	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Boilers	7335.2850	4.4400	325.6867	(340a)
Space heating total			325.6867	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Boilers	4399.8424	4.4400	195.3530	(342a)
Water heating total			195.3530	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Space cooling	26.8665	16.4900	4.4303	(348)
Pumps, fans and electric keep-hot	265.7509	16.4900	43.8223	(349)
Energy for lighting	231.1003	16.4900	38.1084	(350)
Additional standing charges			92.0000	(351)
Total energy cost			699.4007	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.8492	(357)
SAP value		70.0248	
SAP rating (Section 12)		70	(358)
SAP band		C	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			95.0000	(367)
Space and Water heating from Boilers	12352.7657	0.2100	1621.4841	(367)
Electrical energy for heat distribution (space & water)	73.3529	0.0000	17.5593	(372)
Overall CO2 factor for heat network			0.2225	(386)
Total CO2 associated with community systems			2611.6401	(373)
Space and water heating			2611.6401	(376)
Space cooling	26.8665	0.1137	3.0544	(377)
Pumps, fans and electric keep-hot	265.7509	0.1387	36.8629	(378)
Energy for lighting	231.1003	0.1443	33.3549	(379)
Total CO2, kg/year			2684.9124	(383)
CO2 emissions per m2			29.4500	(384)
EI value			73.5768	(384a)
EI rating			74	(385)
EI band			C	

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		91.1600 (1b)	x	2.5100 (2b)	=	228.8116	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.1600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	228.8116	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)

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

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		6.0000 (17)
Infiltration rate		0.3000 (18)
Number of sides sheltered		4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2100 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.2000	4.1000	3.8000	3.9000	3.4000	3.5000	3.4000	3.4000	3.7000	3.6000	4.0000	(22)
Wind factor	1.0750	1.0500	1.0250	0.9500	0.9750	0.8500	0.8750	0.8500	0.8500	0.9250	0.9000	1.0000	(22a)
Adj infilt rate	0.2257	0.2205	0.2152	0.1995	0.2047	0.1785	0.1837	0.1785	0.1785	0.1943	0.1890	0.2100	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.2000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3297	0.3245	0.3192	0.3035	0.3087	0.2825	0.2877	0.2825	0.2825	0.2983	0.2930	0.3140	(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	
Windows (Uw = 1.40)			12.0300	1.3258	15.9489			(27)
Glazed Doors (Uw = 1.40)			18.2200	1.3258	24.1553			(27)
RL			1.1500	1.3258	1.5246			(27a)
Basement Floor			91.1600	0.2500	22.7900	110.0000	10027.6000	(28a)
Retaining Walls	21.8400		21.8400	0.3000	6.5520	9.0000	196.5600	(29a)
Wall to Lightwells	59.2100	27.4600	31.7500	0.3000	9.5250	9.0000	285.7500	(29a)
New External Wall	4.2100	2.7900	1.4200	0.1800	0.2556	150.0000	213.0000	(29a)
Flat Roof	3.4400	1.1500	2.2900	0.1500	0.3435	9.0000	20.6100	(30)
Total net area of external elements Aum(A, m2)			179.8600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	81.0949			(33)
Wall to Corridor			30.0100	0.0000	0.0000	20.0000	600.2000	(32)
Party Ceiling 1			87.7200			40.0000	3508.8000	(32b)
Internal Wall 1			163.0800			75.0000	12231.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 27083.5200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	297.0987 (35)
Thermal bridges (Default value 0.200 * total exposed area)	35.9720 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 117.0669 (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	24.8987	24.5023	24.1059	22.9166	23.3130	21.3310	21.7274	21.3310	21.3310	22.5202	22.1238	23.7095	(38)
Heat transfer coeff	141.9656	141.5692	141.1728	139.9835	140.3799	138.3978	138.7943	138.3978	138.3978	139.5871	139.1907	140.7763	(39)
Average = Sum(39)m / 12 =												139.8844	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5573	1.5530	1.5486	1.5356	1.5399	1.5182	1.5225	1.5182	1.5182	1.5312	1.5269	1.5443	(40)
HLP (average)												1.5345	
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	2.6413 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
77.0683	75.9101	74.2224	70.9933	68.6103	65.9527	64.4422	66.1171	67.9532	70.8065	74.1050	76.7730	(42a)

Hot water usage for baths

29.5827	29.1433	28.5246	27.3839	26.5297	25.5826	25.0710	25.6853	26.3542	27.3677	28.5320	29.4827	(42b)

Hot water usage for other uses

41.6792	40.1636	38.6480	37.1324	35.6168	34.1012	34.1012	35.6168	37.1324	38.6480	40.1636	41.6792	(42c)

Average daily hot water use (litres/day)	136.3724 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.3302	145.2170	141.3950	135.5095	130.7567	125.6365	123.6143	127.4192	131.4398	136.8223	142.8006	147.9349	(44)
Energy conte	234.9187	206.7871	217.3189	185.5058	176.0237	154.4847	149.5008	157.7716	162.0784	185.6665	203.4456	231.6303	(45)
Energy content (annual)										Total = Sum(45)m =		2265.1323	
Distribution loss (46)m = 0.15 x (45)m	35.2378	31.0181	32.5978	27.8259	26.4036	23.1727	22.4251	23.6657	24.3118	27.8500	30.5168	34.7445	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.0800	(55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	291.6611	258.0383	274.0613	240.4178	232.7661	209.3967	206.2432	214.5140	216.9904	242.4089	258.3576	288.3727	(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	291.6611	258.0383	274.0613	240.4178	232.7661	209.3967	206.2432	214.5140	216.9904	242.4089	258.3576	288.3727	(64)

											Total per year (kWh/year) = Sum(64)m =	2933.2283	(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													
123.5044	109.7577	117.6524	105.6103	103.9218	95.2958	95.1029	97.8530	97.8207	107.1280	111.5753	122.4110		(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	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	32.7146	29.0568	23.6306	17.8899	13.3729	11.2900	12.1992	15.8570	21.2832	27.0240	31.5409	33.6239	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.9936	363.7292	354.3156	334.2751	308.9777	285.2016	269.3177	265.5821	274.9957	295.0362	320.3337	344.1097	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	(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)													
	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	(71)
Water heating gains (Table 5)													
	166.0005	163.3299	158.1350	146.6809	139.6798	132.3552	127.8265	131.5228	135.8621	143.9893	154.9657	164.5309	(72)
Total internal gains													
	665.0230	662.4301	642.3954	605.1602	568.3446	535.1610	515.6577	519.2762	538.4552	572.3636	613.1545	648.5787	(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	2.2500	11.5683	0.4000	0.7000	0.5400	3.5420	(74)
South	9.7800	49.1384	0.4000	0.7000	0.5400	65.3965	(78)
North	3.6100	11.5683	0.4000	0.7000	0.5400	5.6829	(74)
West	14.6100	21.5704	0.4000	0.7000	0.5400	42.8846	(80)
East	1.1500	29.0000	0.4000	0.7000	1.0000	8.4042	(82)

Solar gains	125.9102	202.7774	301.9208	420.1727	483.5259	523.0921	498.7391	452.6175	371.8118	252.0503	157.9888	104.3497	(83)
Total gains	790.9332	865.2075	944.3162	1025.3329	1051.8705	1058.2531	1014.3968	971.8937	910.2670	824.4139	771.1433	752.9284	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.9931	53.1415	53.2907	53.7435	53.5917	54.3592	54.2040	54.3592	54.3592	53.8961	54.0496	53.4408	
alpha	4.5329	4.5428	4.5527	4.5829	4.5728	4.6239	4.6136	4.6239	4.6239	4.5931	4.6033	4.5627	
util living area													
	0.9938	0.9899	0.9758	0.9330	0.8154	0.5556	0.3271	0.3679	0.7144	0.9410	0.9867	0.9949	(86)
MIT	19.6401	19.7810	20.1204	20.5050	20.8254	20.9797	20.9987	20.9978	20.9329	20.5632	20.0545	19.6197	(87)
Th 2	19.6448	19.6480	19.6512	19.6609	19.6577	19.6739	19.6706	19.6739	19.6739	19.6642	19.6674	19.6545	(88)
util rest of house													
	0.9911	0.9855	0.9643	0.8992	0.7241	0.3984	0.1465	0.1813	0.5669	0.9024	0.9796	0.9926	(89)
MIT 2	18.1345	18.3154	18.7443	19.2148	19.5479	19.6692	19.6706	19.6738	19.6490	19.2952	18.6772	18.1153	(90)
Living area fraction										fLA = Living area / (4) =		0.3214	(91)
MIT	18.6184	18.7865	19.1866	19.6295	19.9585	20.0904	20.0975	20.0994	20.0617	19.7027	19.1199	18.5988	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6184	18.7865	19.1866	19.6295	19.9585	20.0904	20.0975	20.0994	20.0617	19.7027	19.1199	18.5988	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9880	0.9814	0.9590	0.8982	0.7474	0.4498	0.2048	0.2417	0.6143	0.9039	0.9754	0.9900	(94)
Useful gains	781.4716	849.1482	905.5580	920.9432	786.1926	475.9891	207.7330	234.9351	559.2214	745.1761	752.1997	745.3965	(95)
Ext temp.	5.5000	6.0000	8.0000	10.5000	13.6000	16.6000	18.6000	18.4000	15.8000	12.2000	8.5000	5.5000	(96)
Heat loss rate W													
1862.3679	1810.1709	1579.2387	1277.9801	892.6104	483.0635	207.8431	235.1874	589.8034	1047.2862	1478.1915	1844.0008		(97)
Space heating kWh													
804.1868	645.8072	501.2185	257.0665	79.1748	0.0000	0.0000	0.0000	0.0000	224.7699	522.7141	817.3616		(98a)
Space heating requirement - total per year (kWh/year)												3852.2995	
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													
804.1868	645.8072	501.2185	257.0665	79.1748	0.0000	0.0000	0.0000	0.0000	224.7699	522.7141	817.3616		(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3852.2995	
Space heating per m2											(98c) / (4) =	42.2587	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	5.5000	6.0000	8.0000	10.5000	13.6000	16.6000	18.6000	18.4000	15.8000	12.2000	8.5000	5.5000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1024.1441	749.4890	775.0280	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8792	0.9461	0.9303	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	900.4772	709.1002	720.9801	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1195.0396	1144.9980	1091.2335	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	212.0849	324.3080	275.4686	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		0.6582	(105)
Intermittency factor (Table 10b)													

	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	34.8977	53.3635	45.3272	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												133.5884	(107)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Boilers-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	804.1868	645.8072	501.2185	257.0665	79.1748	0.0000	0.0000	0.0000	0.0000	224.7699	522.7141	817.3616	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.50													
307a	1206.2803	968.7108	751.8277	385.5998	118.7623	0.0000	0.0000	0.0000	0.0000	337.1549	784.0712	1226.0424	
Space heating requirement													
	1206.2803	968.7108	751.8277	385.5998	118.7623	0.0000	0.0000	0.0000	0.0000	337.1549	784.0712	1226.0424	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating													
Annual water heating requirement													
	291.6611	258.0383	274.0613	240.4178	232.7661	209.3967	206.2432	214.5140	216.9904	242.4089	258.3576	288.3727	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.50													
310a	437.4917	387.0575	411.0919	360.6267	349.1492	314.0951	309.3649	321.7711	325.4857	363.6134	387.5364	432.5590	
Water heating fuel													
	437.4917	387.0575	411.0919	360.6267	349.1492	314.0951	309.3649	321.7711	325.4857	363.6134	387.5364	432.5590	(310)
Cooling System Energy Efficiency Ratio												2.6000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	13.4222	20.5244	17.4335	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	22.5706	20.3864	22.5706	21.8425	22.5706	21.8425	22.5706	22.5706	21.8425	22.5706	21.8425	22.5706	(331)
Lighting	28.6349	22.9720	20.6837	15.1538	11.7052	9.5633	10.6779	13.8795	18.0281	23.6539	26.7170	29.4308	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year		
Space heating fuel - community heating	5778.4493	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	4399.8424	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	57.7845	(313)
Space cooling fuel	51.3802	(321)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9520)		
mechanical ventilation fans (SFP = 0.9520)	265.7509	(330a)
Total electricity for the above, kWh/year	265.7509	(331)
Electricity for lighting (calculated in Appendix L)	231.1003	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	10726.5231	(338)

10b. Fuel costs - using BEDF prices (533)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Boilers	5778.4493	4.8000	277.3656	(340a)
Space heating total			277.3656	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Boilers	4399.8424	4.8000	211.1924	(342a)
Water heating total			211.1924	(342)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000	(347a)
Space cooling	51.3802	21.5100	11.0519	(348)
Pumps, fans and electric keep-hot	265.7509	21.5100	57.1630	(349)
Energy for lighting	231.1003	21.5100	49.7097	(350)
Additional standing charges			98.0000	(351)
Total energy cost			704.4826	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			95.0000	(367)
Space and Water heating from Boilers	10713.9912	0.2100	1277.3414	(367)
Electrical energy for heat distribution (space & water)	57.7845	0.0000	15.2161	(372)
Overall CO2 factor for heat network			0.2225	(386)
Total CO2 associated with community systems			2265.1542	(373)
Space and water heating			2265.1542	(376)
Space cooling	51.3802	0.1137	5.8414	(377)
Pumps, fans and electric keep-hot	265.7509	0.1387	36.8629	(378)
Energy for lighting	231.1003	0.1443	33.3549	(379)

Total CO2, kg/year 2341.2135 (383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Boilers			95.0000	(467a)
Space and Water heating from Boilers	10713.9912	1.1300	6873.3134	(467)
Electrical energy for heat distribution (space & water)	57.7845	0.0000	158.0885	(472)
Overall CO2 factor for heat network			1.2050	(486)
Total CO2 associated with community systems			12264.8986	(473)
Space and water heating			12264.8986	(476)
Space cooling	51.3802	1.4191	72.9144	(477)
Pumps, fans and electric keep-hot	265.7509	1.5128	402.0280	(478)
Energy for lighting	231.1003	1.5338	354.4693	(479)
Total Primary energy kWh/year			13094.3104	(483)

SAP 10 EPC IMPROVEMENTS

Apartment 2 Be Green

Current energy efficiency rating: C 70
Current environmental impact rating: C 74

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

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

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

Potential energy efficiency rating: C 70
Potential environmental impact rating: C 74

Fuel prices for cost data on this page from database revision number 533 TEST (30 Nov 2023)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£118	£118	£0
Community scheme	£587	£587	£0
Space heating	£433	£433	£0
Space cooling	£11	£11	£0
Water heating	£211	£211	£0
Lighting	£50	£50	£0
Total cost of fuels	£705	£705	£0
Total cost of uses	£705	£705	£0
Delivered energy	118 kWh/m²	118 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.3 tonnes	2.3 tonnes	0.0 tonnes
CO2 emissions per m²	26 kg/m²	26 kg/m²	0 kg/m²
Primary energy	144 kWh/m²	144 kWh/m²	0 kWh/m²

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	91.1600 (1b)	x	2.5100 (2b)	=	228.8116	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	228.8116	(5)

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2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		6.0000	(17)
Infiltration rate		0.3000	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2100	(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													
	0.2677	0.2625	0.2573	0.2310	0.2257	0.1995	0.1995	0.1943	0.2100	0.2257	0.2362	0.2467	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.2000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3717	0.3665	0.3613	0.3350	0.3297	0.3035	0.3035	0.2983	0.3140	0.3297	0.3402	0.3508	(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	
Windows (Uw = 1.40)			12.0300	1.3258	15.9489			(27)
Glazed Doors (Uw = 1.40)			18.2200	1.3258	24.1553			(27)
RL			1.1500	1.3258	1.5246			(27a)
Basement Floor			91.1600	0.2500	22.7900	110.0000	10027.6000	(28a)
Retaining Walls	21.8400		21.8400	0.3000	6.5520	9.0000	196.5600	(29a)
Wall to Lightwells	59.2100	27.4600	31.7500	0.3000	9.5250	9.0000	285.7500	(29a)
New External Wall	4.2100	2.7900	1.4200	0.1800	0.2556	150.0000	213.0000	(29a)
Flat Roof	3.4400	1.1500	2.2900	0.1500	0.3435	9.0000	20.6100	(30)
Total net area of external elements Aum(A, m2)			179.8600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		81.0949			(33)
Wall to Corridor			30.0100	0.0000	0.0000	20.0000	600.2000	(32)
Party Ceiling 1			87.7200			40.0000	3508.8000	(32b)
Internal Wall 1			163.0800			75.0000	12231.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	27083.5200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		297.0987 (35)
Thermal bridges (Default value 0.200 * total exposed area)		35.9720 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	117.0669 (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	28.0700	27.6736	27.2772	25.2951	24.8987	22.9166	22.9166	22.5202	23.7095	24.8987	25.6915	26.4844	(38)
Heat transfer coeff													
	145.1369	144.7405	144.3441	142.3620	141.9656	139.9835	139.9835	139.5871	140.7763	141.9656	142.7584	143.5513	(39)
Average = Sum(39)m / 12 =												142.2629	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5921	1.5878	1.5834	1.5617	1.5573	1.5356	1.5356	1.5312	1.5443	1.5573	1.5660	1.5747	(40)
HLP (average)												1.5606	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6413	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	77.0683	75.9101	74.2224	70.9933	68.6103	65.9527	64.4422	66.1171	67.9532	70.8065	74.1050	76.7730	(42a)
Hot water usage for baths													
	29.5827	29.1433	28.5246	27.3839	26.5297	25.5826	25.0710	25.6853	26.3542	27.3677	28.5320	29.4827	(42b)
Hot water usage for other uses													
	41.6792	40.1636	38.6480	37.1324	35.6168	34.1012	34.1012	35.6168	37.1324	38.6480	40.1636	41.6792	(42c)
Average daily hot water use (litres/day)												136.3724	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.3302	145.2170	141.3950	135.5095	130.7567	125.6365	123.6143	127.4192	131.4398	136.8223	142.8006	147.9349	(44)
Energy conte	234.9187	206.7871	217.3189	185.5058	176.0237	154.4847	149.5008	157.7716	162.0784	185.6665	203.4456	231.6303	(45)
Energy content (annual)										Total = Sum(45)m =		2265.1323	
Distribution loss (46)m = 0.15 x (45)m													
	35.2378	31.0181	32.5978	27.8259	26.4036	23.1727	22.4251	23.6657	24.3118	27.8500	30.5168	34.7445	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.0800	(55)
Total storage loss													
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage													
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	291.6611	258.0383	274.0613	240.4178	232.7661	209.3967	206.2432	214.5140	216.9904	242.4089	258.3576	288.3727	(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													
	291.6611	258.0383	274.0613	240.4178	232.7661	209.3967	206.2432	214.5140	216.9904	242.4089	258.3576	288.3727	(64)
										Total per year (kWh/year) = Sum(64)m =		2933.2283	(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													
	123.5044	109.7577	117.6524	105.6103	103.9218	95.2958	95.1029	97.8530	97.8207	107.1280	111.5753	122.4110	(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	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	32.7146	29.0568	23.6306	17.8899	13.3729	11.2900	12.1992	15.8570	21.2832	27.0240	31.5409	33.6239	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.9936	363.7292	354.3156	334.2751	308.9777	285.2016	269.3177	265.5821	274.9957	295.0362	320.3337	344.1097	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	(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)													
	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	(71)
Water heating gains (Table 5)													
	166.0005	163.3299	158.1350	146.6809	139.6798	132.3552	127.8265	131.5228	135.8621	143.9893	154.9657	164.5309	(72)
Total internal gains													
	665.0230	662.4301	642.3954	605.1602	568.3446	535.1610	515.6577	519.2762	538.4552	572.3636	613.1545	648.5787	(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	2.2500	10.6334	0.4000	0.7000	0.5400	3.2557	(74)
South	9.7800	46.7521	0.4000	0.7000	0.5400	62.2206	(78)
North	3.6100	10.6334	0.4000	0.7000	0.5400	5.2236	(74)
West	14.6100	19.6403	0.4000	0.7000	0.5400	39.0474	(80)
East	1.1500	26.0000	0.4000	0.7000	1.0000	7.5348	(82)

Solar gains	117.2821	210.1399	310.9555	417.8705	492.9425	499.0332	477.1985	420.5713	348.3342	238.9634	142.4639	99.0296	(83)
Total gains	782.3051	872.5701	953.3509	1023.0307	1061.2872	1034.1942	992.8562	939.8475	886.7894	811.3270	755.6183	747.6083	(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	51.8352	51.9772	52.1199	52.8456	52.9931	53.7435	53.7435	53.8961	53.4408	52.9931	52.6988	52.4078	
alpha	4.4557	4.4651	4.4747	4.5230	4.5329	4.5829	4.5829	4.5931	4.5627	4.5329	4.5133	4.4939	
util living area													
	0.9956	0.9922	0.9836	0.9592	0.8960	0.7574	0.5920	0.6405	0.8555	0.9690	0.9920	0.9964	(86)
MIT	19.4267	19.5983	19.8936	20.2878	20.6449	20.8914	20.9728	20.9613	20.7951	20.3364	19.8144	19.4017	(87)
Th 2	19.6191	19.6223	19.6255	19.6416	19.6448	19.6609	19.6609	19.6642	19.6545	19.6448	19.6383	19.6319	(88)
util rest of house													
	0.9938	0.9890	0.9765	0.9397	0.8433	0.6417	0.4263	0.4757	0.7651	0.9501	0.9881	0.9950	(89)
MIT 2	17.8445	18.0651	18.4413	18.9415	19.3574	19.6054	19.6545	19.6535	19.5266	19.0117	18.3529	17.8214	(90)
Living area fraction									fLA = Living area / (4) =			0.3214	(91)
MIT	18.3531	18.5579	18.9081	19.3742	19.7712	20.0188	20.0782	20.0739	19.9343	19.4375	18.8227	18.3293	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3531	18.5579	18.9081	19.3742	19.7712	20.0188	20.0782	20.0739	19.9343	19.4375	18.8227	18.3293	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9913	0.9853	0.9713	0.9347	0.8492	0.6761	0.4807	0.5298	0.7874	0.9462	0.9847	0.9929	(94)
Useful gains	775.5244	859.7760	925.9465	956.2699	901.2253	699.1822	477.2366	497.8980	698.2833	767.6730	744.0205	742.2637	(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													
	2039.6197	1976.8507	1791.0322	1491.1324	1145.8380	758.5381	486.8898	512.8221	821.3321	1254.6147	1673.5084	2028.2806	(97)
Space heating kWh													
	940.4869	750.6742	643.6238	385.1009	181.9919	0.0000	0.0000	0.0000	0.0000	362.2846	669.2313	956.7966	(98a)
Space heating requirement - total per year (kWh/year)												4890.1900	
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													
	940.4869	750.6742	643.6238	385.1009	181.9919	0.0000	0.0000	0.0000	0.0000	362.2846	669.2313	956.7966	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4890.1900	
Space heating per m2										(98c) / (4) =		53.6440	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1315.8450	1035.8780	1060.8619	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7675	0.8507	0.8173	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1009.9730	881.2335	867.0885	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1164.8826	1118.0196	1050.9801	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	111.5349	176.1688	136.8154	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			0.6582	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	18.3526	28.9878	22.5124	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												69.8529	(107)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Boilers-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	940.4869	750.6742	643.6238	385.1009	181.9919	0.0000	0.0000	0.0000	0.0000	362.2846	669.2313	956.7966	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.50													
307a	1410.7303	1126.0113	965.4356	577.6514	272.9878	0.0000	0.0000	0.0000	0.0000	543.4268	1003.8469	1435.1949	
Space heating requirement													
	1410.7303	1126.0113	965.4356	577.6514	272.9878	0.0000	0.0000	0.0000	0.0000	543.4268	1003.8469	1435.1949	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	291.6611	258.0383	274.0613	240.4178	232.7661	209.3967	206.2432	214.5140	216.9904	242.4089	258.3576	288.3727	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.50													
310a	437.4917	387.0575	411.0919	360.6267	349.1492	314.0951	309.3649	321.7711	325.4857	363.6134	387.5364	432.5590	
Water heating fuel													
	437.4917	387.0575	411.0919	360.6267	349.1492	314.0951	309.3649	321.7711	325.4857	363.6134	387.5364	432.5590	(310)
Cooling System Energy Efficiency Ratio												2.6000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	7.0587	11.1492	8.6586	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	22.5706	20.3864	22.5706	21.8425	22.5706	21.8425	22.5706	22.5706	21.8425	22.5706	21.8425	22.5706	(331)
Lighting	28.6349	22.9720	20.6837	15.1538	11.7052	9.5633	10.6779	13.8795	18.0281	23.6539	26.7170	29.4308	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												7335.2850	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4399.8424	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												73.3529	(313)
Space cooling fuel												26.8665	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9520)													
mechanical ventilation fans (SFP = 0.9520)												265.7509	(330a)
Total electricity for the above, kWh/year												265.7509	(331)
Electricity for lighting (calculated in Appendix L)												231.1003	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													
Energy saved or generated												-0.0000	(336)
Energy used												0.0000	(337)
Total delivered energy for all uses												12258.8451	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Boilers	7335.2850	4.4400	325.6867	(340a)
Space heating total			325.6867	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Boilers	4399.8424	4.4400	195.3530	(342a)
Water heating total			195.3530	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Space cooling	26.8665	16.4900	4.4303	(348)
Pumps, fans and electric keep-hot	265.7509	16.4900	43.8223	(349)
Energy for lighting	231.1003	16.4900	38.1084	(350)
Additional standing charges			92.0000	(351)
Total energy cost			699.4007	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.8492	(357)
SAP value		70.0248	
SAP rating (Section 12)		70	(358)
SAP band		C	

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			95.0000	(367)
Space and Water heating from Boilers	12352.7657	0.2100	1621.4841	(367)
Electrical energy for heat distribution (space & water)	73.3529	0.0000	17.5593	(372)
Overall CO2 factor for heat network			0.2225	(386)

Total CO2 associated with community systems			2611.6401	(373)
Space and water heating			2611.6401	(376)
Space cooling	26.8665	0.1137	3.0544	(377)
Pumps, fans and electric keep-hot	265.7509	0.1387	36.8629	(378)
Energy for lighting	231.1003	0.1443	33.3549	(379)
Total CO2, kg/year			2684.9124	(383)
CO2 emissions per m2			29.4500	(384)
EI value			73.5768	(384a)
EI rating			74	(385)
EI band			C	

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	91.1600	(1b) x	2.5100	(2b) =	228.8116	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.1600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		228.8116	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		6.0000	(17)
Infiltration rate		0.3000	(18)
Number of sides sheltered		4	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2100	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.2000	4.1000	3.8000	3.9000	3.4000	3.5000	3.4000	3.4000	3.7000	3.6000	4.0000	(22)
Wind factor	1.0750	1.0500	1.0250	0.9500	0.9750	0.8500	0.8750	0.8500	0.8500	0.9250	0.9000	1.0000	(22a)
Adj infilt rate	0.2257	0.2205	0.2152	0.1995	0.2047	0.1785	0.1837	0.1785	0.1785	0.1943	0.1890	0.2100	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.2000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3297	0.3245	0.3192	0.3035	0.3087	0.2825	0.2877	0.2825	0.2825	0.2983	0.2930	0.3140	(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	
Windows (Uw = 1.40)			12.0300	1.3258	15.9489			(27)
Glazed Doors (Uw = 1.40)			18.2200	1.3258	24.1553			(27)
RL			1.1500	1.3258	1.5246			(27a)
Basement Floor			91.1600	0.2500	22.7900	110.0000	10027.6000	(28a)
Retaining Walls	21.8400		21.8400	0.3000	6.5520	9.0000	196.5600	(29a)
Wall to Lightwells	59.2100	27.4600	31.7500	0.3000	9.5250	9.0000	285.7500	(29a)
New External Wall	4.2100	2.7900	1.4200	0.1800	0.2556	150.0000	213.0000	(29a)
Flat Roof	3.4400	1.1500	2.2900	0.1500	0.3435	9.0000	20.6100	(30)
Total net area of external elements Aum(A, m2)			179.8600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		81.0949			(33)
Wall to Corridor			30.0100	0.0000	0.0000	20.0000	600.2000	(32)
Party Ceiling 1			87.7200			40.0000	3508.8000	(32b)
Internal Wall 1			163.0800			75.0000	12231.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	27083.5200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		297.0987 (35)
Thermal bridges (Default value 0.200 * total exposed area)		35.9720 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	117.0669 (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	24.8987	24.5023	24.1059	22.9166	23.3130	21.3310	21.7274	21.3310	21.3310	22.5202	22.1238	23.7095	(38)
Heat transfer coeff	141.9656	141.5692	141.1728	139.9835	140.3799	138.3978	138.7943	138.3978	138.3978	139.5871	139.1907	140.7763	(39)
Average = Sum(39)m / 12 =												139.8844	

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

HLP	1.5573	1.5530	1.5486	1.5356	1.5399	1.5182	1.5225	1.5182	1.5182	1.5312	1.5269	1.5443	(40)
HLP (average)												1.5345	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6413	(42)
Hot water usage for mixer showers													
	77.0683	75.9101	74.2224	70.9933	68.6103	65.9527	64.4422	66.1171	67.9532	70.8065	74.1050	76.7730	(42a)
Hot water usage for baths													
	29.5827	29.1433	28.5246	27.3839	26.5297	25.5826	25.0710	25.6853	26.3542	27.3677	28.5320	29.4827	(42b)
Hot water usage for other uses													
	41.6792	40.1636	38.6480	37.1324	35.6168	34.1012	34.1012	35.6168	37.1324	38.6480	40.1636	41.6792	(42c)
Average daily hot water use (litres/day)												136.3724	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	148.3302	145.2170	141.3950	135.5095	130.7567	125.6365	123.6143	127.4192	131.4398	136.8223	142.8006	147.9349	(44)
Energy conte	234.9187	206.7871	217.3189	185.5058	176.0237	154.4847	149.5008	157.7716	162.0784	185.6665	203.4456	231.6303	(45)
Energy content (annual)										Total = Sum(45)m =		2265.1323	
Distribution loss (46)m = 0.15 x (45)m													
	35.2378	31.0181	32.5978	27.8259	26.4036	23.1727	22.4251	23.6657	24.3118	27.8500	30.5168	34.7445	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.0800	(55)
Total storage loss													
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage													
	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	291.6611	258.0383	274.0613	240.4178	232.7661	209.3967	206.2432	214.5140	216.9904	242.4089	258.3576	288.3727	(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													
	291.6611	258.0383	274.0613	240.4178	232.7661	209.3967	206.2432	214.5140	216.9904	242.4089	258.3576	288.3727	(64)
										Total per year (kWh/year) = Sum(64)m =		2933.2283	(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													
	123.5044	109.7577	117.6524	105.6103	103.9218	95.2958	95.1029	97.8530	97.8207	107.1280	111.5753	122.4110	(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	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	158.4760	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	32.7146	29.0568	23.6306	17.8899	13.3729	11.2900	12.1992	15.8570	21.2832	27.0240	31.5409	33.6239	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	359.9936	363.7292	354.3156	334.2751	308.9777	285.2016	269.3177	265.5821	274.9957	295.0362	320.3337	344.1097	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	53.4889	(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)													
	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	-105.6507	(71)
Water heating gains (Table 5)													
	166.0005	163.3299	158.1350	146.6809	139.6798	132.3552	127.8265	131.5228	135.8621	143.9893	154.9657	164.5309	(72)
Total internal gains													
	665.0230	662.4301	642.3954	605.1602	568.3446	535.1610	515.6577	519.2762	538.4552	572.3636	613.1545	648.5787	(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	2.2500	11.5683	0.4000	0.7000	0.5400	3.5420	(74)
South	9.7800	49.1384	0.4000	0.7000	0.5400	65.3965	(78)
North	3.6100	11.5683	0.4000	0.7000	0.5400	5.6829	(74)
West	14.6100	21.5704	0.4000	0.7000	0.5400	42.8846	(80)
East	1.1500	29.0000	0.4000	0.7000	1.0000	8.4042	(82)

Solar gains	125.9102	202.7774	301.9208	420.1727	483.5259	523.0921	498.7391	452.6175	371.8118	252.0503	157.9888	104.3497	(83)
Total gains	790.9332	865.2075	944.3162	1025.3329	1051.8705	1058.2531	1014.3968	971.8937	910.2670	824.4139	771.1433	752.9284	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.9931	53.1415	53.2907	53.7435	53.5917	54.3592	54.2040	54.3592	54.3592	53.8961	54.0496	53.4408	
alpha	4.5329	4.5428	4.5527	4.5829	4.5728	4.6239	4.6136	4.6239	4.6239	4.5931	4.6033	4.5627	
util living area													
	0.9938	0.9899	0.9758	0.9330	0.8154	0.5556	0.3271	0.3679	0.7144	0.9410	0.9867	0.9949	(86)
MIT	19.6401	19.7810	20.1204	20.5050	20.8254	20.9797	20.9987	20.9978	20.9329	20.5632	20.0545	19.6197	(87)
Th 2	19.6448	19.6480	19.6512	19.6609	19.6577	19.6739	19.6706	19.6739	19.6739	19.6642	19.6674	19.6545	(88)
util rest of house													
	0.9911	0.9855	0.9643	0.8992	0.7241	0.3984	0.1465	0.1813	0.5669	0.9024	0.9796	0.9926	(89)
MIT 2	18.1345	18.3154	18.7443	19.2148	19.5479	19.6692	19.6706	19.6738	19.6490	19.2952	18.6772	18.1153	(90)

Living area fraction										fLA = Living area / (4) =		0.3214	(91)
MIT	18.6184	18.7865	19.1866	19.6295	19.9585	20.0904	20.0975	20.0994	20.0617	19.7027	19.1199	18.5988	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6184	18.7865	19.1866	19.6295	19.9585	20.0904	20.0975	20.0994	20.0617	19.7027	19.1199	18.5988	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9880	0.9814	0.9590	0.8982	0.7474	0.4498	0.2048	0.2417	0.6143	0.9039	0.9754	0.9900	(94)
Useful gains	781.4716	849.1482	905.5580	920.9432	786.1926	475.9891	207.7330	234.9351	559.2214	745.1761	752.1997	745.3965	(95)
Ext temp.	5.5000	6.0000	8.0000	10.5000	13.6000	16.6000	18.6000	18.4000	15.8000	12.2000	8.5000	5.5000	(96)
Heat loss rate W													
	1862.3679	1810.1709	1579.2387	1277.9801	892.6104	483.0635	207.8431	235.1874	589.8034	1047.2862	1478.1915	1844.0008	(97)
Space heating kWh													
	804.1868	645.8072	501.2185	257.0665	79.1748	0.0000	0.0000	0.0000	0.0000	224.7699	522.7141	817.3616	(98a)
Space heating requirement - total per year (kWh/year)												3852.2995	
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													
	804.1868	645.8072	501.2185	257.0665	79.1748	0.0000	0.0000	0.0000	0.0000	224.7699	522.7141	817.3616	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3852.2995	
Space heating per m2											(98c) / (4) =	42.2587	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	5.5000	6.0000	8.0000	10.5000	13.6000	16.6000	18.6000	18.4000	15.8000	12.2000	8.5000	5.5000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	1024.1441	749.4890	775.0280	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8792	0.9461	0.9303	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	900.4772	709.1002	720.9801	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1195.0396	1144.9980	1091.2335	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	212.0849	324.3080	275.4686	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		0.6582	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	34.8977	53.3635	45.3272	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												133.5884	(107)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Boilers-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	804.1868	645.8072	501.2185	257.0665	79.1748	0.0000	0.0000	0.0000	0.0000	224.7699	522.7141	817.3616	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.50													
307a	1206.2803	968.7108	751.8277	385.5998	118.7623	0.0000	0.0000	0.0000	0.0000	337.1549	784.0712	1226.0424	
Space heating requirement													
	1206.2803	968.7108	751.8277	385.5998	118.7623	0.0000	0.0000	0.0000	0.0000	337.1549	784.0712	1226.0424	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	291.6611	258.0383	274.0613	240.4178	232.7661	209.3967	206.2432	214.5140	216.9904	242.4089	258.3576	288.3727	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.50													
310a	437.4917	387.0575	411.0919	360.6267	349.1492	314.0951	309.3649	321.7711	325.4857	363.6134	387.5364	432.5590	
Water heating fuel													
	437.4917	387.0575	411.0919	360.6267	349.1492	314.0951	309.3649	321.7711	325.4857	363.6134	387.5364	432.5590	(310)
Cooling System Energy Efficiency Ratio												2.6000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	13.4222	20.5244	17.4335	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	22.5706	20.3864	22.5706	21.8425	22.5706	21.8425	22.5706	22.5706	21.8425	22.5706	21.8425	22.5706	(331)
Lighting	28.6349	22.9720	20.6837	15.1538	11.7052	9.5633	10.6779	13.8795	18.0281	23.6539	26.7170	29.4308	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												5778.4493	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												4399.8424	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												57.7845	(313)
Space cooling fuel												51.3802	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9520)													
mechanical ventilation fans (SFP = 0.9520)												265.7509	(330a)
Total electricity for the above, kWh/year												265.7509	(331)
Electricity for lighting (calculated in Appendix L)												231.1003	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)

Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	10726.5231	(338)

10b. Fuel costs - using BEDF prices (533)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Boilers	5778.4493	4.8000	277.3656	(340a)
Space heating total			277.3656	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Boilers	4399.8424	4.8000	211.1924	(342a)
Water heating total			211.1924	(342)
Energy for instantaneous electric shower(s)	0.0000	21.5100	0.0000	(347a)
Space cooling	51.3802	21.5100	11.0519	(348)
Pumps, fans and electric keep-hot	265.7509	21.5100	57.1630	(349)
Energy for lighting	231.1003	21.5100	49.7097	(350)
Additional standing charges			98.0000	(351)
Total energy cost			704.4826	(355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			95.0000	(367)
Space and Water heating from Boilers	10713.9912	0.2100	1277.3414	(367)
Electrical energy for heat distribution (space & water)	57.7845	0.0000	15.2161	(372)
Overall CO2 factor for heat network			0.2225	(386)
Total CO2 associated with community systems			2265.1542	(373)
Space and water heating			2265.1542	(376)
Space cooling	51.3802	0.1137	5.8414	(377)
Pumps, fans and electric keep-hot	265.7509	0.1387	36.8629	(378)
Energy for lighting	231.1003	0.1443	33.3549	(379)
Total CO2, kg/year			2341.2135	(383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Boilers			95.0000	(467a)
Space and Water heating from Boilers	10713.9912	1.1300	6873.3134	(467)
Electrical energy for heat distribution (space & water)	57.7845	0.0000	158.0885	(472)
Overall CO2 factor for heat network			1.2050	(486)
Total CO2 associated with community systems			12264.8986	(473)
Space and water heating			12264.8986	(476)
Space cooling	51.3802	1.4191	72.9144	(477)
Pumps, fans and electric keep-hot	265.7509	1.5128	402.0280	(478)
Energy for lighting	231.1003	1.5338	354.4693	(479)
Total Primary energy kWh/year			13094.3104	(483)