Full SAP Calculation Printout

Plot Reference	Plot 1	**Issued on Date**	15/12/2025
Assessment Reference	Plot 1	**Plot Type Ref**	Plot 1
Plot Address	Plot 1, 58, Canterbury Road, Folkestone, Kent, CT19 5NJ	**SAP Version**	10.2

SAP Rating	72 C	**DER**	6.26	**TER**	15.82
Environmental	96 A	**% DER < TER**			60.43
CO_2 Emissions (t/year)	0.28	**DFEE**	37.74	**TFEE**	40.20
Compliance Check	See BREL	**% DFEE < TFEE**			6.12
% DPER < TPER	15.45	**DPER**	71.07	**TPER**	84.05

Assessor Details	Mr. John Payne	**Assessor ID**	AX81-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	49.7100	(1b)	x 2.7500	(2b) =	136.7025	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7100					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	136.7025	(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		5.0000 (17)
Infiltration rate		0.2500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (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	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(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) =	83.7000 (23c)

Effective ac	0.3524	0.3471	0.3418	0.3152	0.3099	0.2834	0.2834	0.2781	0.2940	0.3099	0.3206	0.3312	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Windows			5.6100	1.1450	6.4237			(27)
Solid door			2.3300	1.2000	2.7960			(26)
Ground floor			49.7100	0.1200	5.9652	75.0000	3728.2500	(28a)
External Wall 1	57.5000	7.9400	49.5600	0.1800	8.9208	70.0000	3469.2000	(29a)
Total net area of external elements Aum(A, m2)			107.2100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.1057			(33)
Main dwelling								
Party Ceiling 1			49.7100			30.0000	1491.3000	(32b)
Timber			33.7400			9.0000	303.6600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8992.4100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		180.8974 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	4.0800	0.0500	0.2040

E3 Sill	2.7200	0.0240	0.0653	
E4 Jamb	11.7000	0.0190	0.2223	
E5 Ground floor (normal)	20.1700	0.0310	0.6253	
E7 Party floor between dwellings (in blocks of flats)	30.0200	0.0320	0.9606	
E16 Corner (normal)	8.2800	0.0400	0.3312	
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0820	-0.2255	
P1 Party wall - Ground floor	9.8500	0.3200	3.1520	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.5200	0.0000	0.0000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3352 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 29.4409 (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	15.8991	15.6594	15.4198	14.2215	13.9818	12.7836	12.7836	12.5439	13.2629	13.9818	14.4612	14.9405	(38)
Heat transfer coeff	45.3400	45.1003	44.8606	43.6624	43.4227	42.2244	42.2244	41.9848	42.7037	43.4227	43.9020	44.3813	(39)
Average = Sum(39)m / 12 =												43.6024	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9121	0.9073	0.9024	0.8783	0.8735	0.8494	0.8494	0.8446	0.8591	0.8735	0.8832	0.8928	(40)
HLP (average)												0.8771	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6816 (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

22.6629	22.3263	21.8523	20.9784	20.3241	19.5985	19.2065	19.6772	20.1896	20.9660	21.8580	22.5863	(42b)

Hot water usage for other uses

31.8509	30.6927	29.5345	28.3763	27.2181	26.0598	26.0598	27.2181	28.3763	29.5345	30.6927	31.8509	(42c)

Average daily hot water use (litres/day) 49.9674 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	54.5138	53.0190	51.3868	49.3547	47.5421	45.6583	45.2664	46.8952	48.5659	50.5005	52.5507	54.4372	(44)
Energy conte	86.3365	75.4984	78.9796	67.5641	64.0008	56.1422	54.7457	58.0661	59.8866	68.5287	74.8680	85.2355	(45)
Energy content (annual)										Total = Sum(45)m =		829.8524	
Distribution loss (46)m = 0.15 x (45)m	12.9505	11.3248	11.8469	10.1346	9.6001	8.4213	8.2119	8.7099	8.9830	10.2793	11.2302	12.7853	(46)
Water storage loss (or HIU loss):													
Store volume												90.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9000	(55)
Total storage loss	27.9000	25.2000	27.9000	27.0000	27.9000	27.0000	27.9000	27.9000	27.0000	27.9000	27.0000	27.9000	(56)
If cylinder contains dedicated solar storage	27.9000	25.2000	27.9000	27.0000	27.9000	27.0000	27.9000	27.9000	27.0000	27.9000	27.0000	27.9000	(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	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(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	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(64)
										Total per year (kWh/year) = Sum(64)m =		1158.3524	(64)
12Total per year (kWh/year)												1158	(64)
Electric shower(s)	41.9747	37.3998	40.8392	38.9723	39.7036	37.8734	39.1359	39.7036	38.9723	40.8392	40.0712	41.9747	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		477.4601	(64a)
Heat gains from water heating, kWh/month	61.5206	54.6132	58.7905	53.8082	53.5262	49.7356	50.3069	51.5529	51.2554	55.3156	56.5114	61.1545	(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	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.1241	92.0303	83.1241	85.8949	83.1241	85.8949	83.1241	83.1241	85.8949	83.1241	85.8949	83.1241	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	146.4808	148.0008	144.1704	136.0160	125.7225	116.0480	109.5849	108.0649	111.8953	120.0497	130.3432	140.0176	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	(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)	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	(71)
Water heating gains (Table 5)	82.6890	81.2696	79.0195	74.7335	71.9438	69.0773	67.6168	69.2915	71.1880	74.3489	78.4881	82.1969	(72)
Total internal gains	360.5173	369.5241	354.5375	344.8679	329.0139	319.2437	308.5493	308.7040	317.2017	325.7462	342.9497	353.5621	(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	
Northeast	2.5500	11.2829	0.6300	0.7000	0.7700	8.7929	(75)
Southwest	3.0600	36.7938	0.6300	0.7000	0.7700	34.4087	(79)

Solar gains	43.2016	76.5090	112.4408	152.3229	182.4831	186.3841	177.5216	154.2226	126.1264	86.6505	52.2775	36.6274	(83)
Total gains	403.7190	446.0332	466.9783	497.1908	511.4969	505.6278	486.0709	462.9266	443.3281	412.3967	395.2272	390.1896	(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	55.0925	55.3853	55.6811	57.2093	57.5250	59.1575	59.1575	59.4952	58.4935	57.5250	56.8970	56.2825	
alpha	4.6728	4.6924	4.7121	4.8140	4.8350	4.9438	4.9438	4.9663	4.8996	4.8350	4.7931	4.7522	
util living area	0.9746	0.9582	0.9303	0.8521	0.7187	0.5229	0.3802	0.4140	0.6316	0.8639	0.9522	0.9775	(86)
MIT	19.9374	20.1263	20.3674	20.6917	20.8931	20.9827	20.9971	20.9956	20.9566	20.7189	20.3118	19.9309	(87)
Th 2	20.1572	20.1613	20.1654	20.1859	20.1901	20.2107	20.2107	20.2149	20.2024	20.1901	20.1818	20.1736	(88)
util rest of house	0.9693	0.9498	0.9162	0.8243	0.6723	0.4626	0.3130	0.3448	0.5691	0.8326	0.9413	0.9728	(89)
MIT 2	18.9290	19.1680	19.4695	19.8724	20.0962	20.1993	20.2094	20.2128	20.1709	19.9136	19.4180	18.9331	(90)
Living area fraction									fLA = Living area / (4) =			0.5279	(91)
MIT	19.4613	19.6738	19.9435	20.3049	20.5169	20.6128	20.6252	20.6260	20.5856	20.3387	19.8898	19.4598	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4613	19.6738	19.9435	20.3049	20.5169	20.6128	20.6252	20.6260	20.5856	20.3387	19.8898	19.4598	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9639	0.9440	0.9120	0.8286	0.6916	0.4937	0.3484	0.3812	0.5998	0.8389	0.9367	0.9678	(94)
Useful gains	389.1513	421.0653	425.8617	411.9937	353.7560	249.6233	169.3469	176.4907	265.9015	345.9393	370.2107	377.6268	(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	687.4118	666.3046	603.0826	497.9645	382.8517	253.8883	169.9610	177.4285	276.9597	422.8794	561.4976	677.2501	(97)
Space heating kWh	221.9058	164.8008	131.8523	61.8990	21.6472	0.0000	0.0000	0.0000	0.0000	57.2434	137.7266	222.9197	(98a)
Space heating requirement - total per year (kWh/year)												1019.9948	
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	221.9058	164.8008	131.8523	61.8990	21.6472	0.0000	0.0000	0.0000	0.0000	57.2434	137.7266	222.9197	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1019.9948	
Space heating per m2											(98c) / (4) =	20.5189	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	221.9058	164.8008	131.8523	61.8990	21.6472	0.0000	0.0000	0.0000	0.0000	57.2434	137.7266	222.9197	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	221.9058	164.8008	131.8523	61.8990	21.6472	0.0000	0.0000	0.0000	0.0000	57.2434	137.7266	222.9197	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.7254	7.8810	8.7254	8.4439	8.7254	8.4439	8.7254	8.7254	8.4439	8.7254	8.4439	8.7254	(231)
Lighting	17.1236	13.7372	12.3688	9.0619	6.9997	5.7188	6.3854	8.2999	10.7808	14.1450	15.9767	17.5996	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.3858	-31.1815	-48.2472	-57.2340	-63.8803	-59.8635	-59.2794	-54.3628	-45.8242	-36.3881	-23.0544	-17.3480	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-4.6574	-10.6085	-22.9260	-38.1521	-53.9611	-55.9933	-55.0464	-45.5241	-32.4073	-17.0349	-6.6505	-3.6089	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1019.9948	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	100.0000	
Water heating fuel used	1158.3524	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6160)		
mechanical ventilation fans (SFP = 0.6160)	102.7347	(230a)
Total electricity for the above, kWh/year	102.7347	(231)
Electricity for lighting (calculated in Appendix L)	138.1976	(232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.6197	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2033.1198	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1019.9948	0.1562	159.3389	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1158.3524	0.1408	163.0550	(264)
Energy for instantaneous electric shower(s)	477.4601	0.1391	66.4253	(264a)
Space and water heating			322.3939	(265)
Pumps, fans and electric keep-hot	102.7347	0.1387	14.2506	(267)
Energy for lighting	138.1976	0.1443	19.9462	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-517.0493	0.1335	-69.0110	
PV Unit electricity exported	-346.5704	0.1233	-42.7226	
Total			-111.7335	(269)
Total CO2, kg/year			311.2824	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.2600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1019.9948	1.5783	1609.8953	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1158.3524	1.5205	1761.2621	(278)
Energy for instantaneous electric shower(s)	477.4601	1.5143	723.0342	(278a)
Space and water heating			3371.1574	(279)
Pumps, fans and electric keep-hot	102.7347	1.5128	155.4170	(281)
Energy for lighting	138.1976	1.5338	211.9720	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-517.0493	1.4932	-772.0737	
PV Unit electricity exported	-346.5704	0.4524	-156.7781	
Total			-928.8519	(283)
Total Primary energy kWh/year			3532.7287	(286)
Dwelling Primary energy Rate (DPER)			71.0700	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	49.7100	(1b)	x 2.7500	(2b) =	136.7025	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		136.7025	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1463	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3963	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3369	(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	0.4295	0.4211	0.4127	0.3705	0.3621	0.3200	0.3200	0.3116	0.3369	0.3621	0.3790	0.3958	(22b)

Effective ac	0.5922	0.5887	0.5851	0.5687	0.5656	0.5512	0.5512	0.5485	0.5567	0.5656	0.5718	0.5783	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opaque door			2.3300	1.0000	2.3300			(26)
TER Opening Type			5.6100	1.1450	6.4237			(27)
Ground floor			49.7100	0.1300	6.4623			(28a)
External Wall 1	57.5000	7.9400	49.5600	0.1800	8.9208			(29a)
Total net area of external elements Aum(A, m2)			107.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.1368			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			180.8974 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	4.0800	0.0500	0.2040
E3 Sill	2.7200	0.0500	0.1360
E4 Jamb	11.7000	0.0500	0.5850
E5 Ground floor (normal)	20.1700	0.1600	3.2272
E7 Party floor between dwellings (in blocks of flats)	30.0200	0.0700	2.1014
E16 Corner (normal)	8.2800	0.0900	0.7452
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0900	-0.2475
P1 Party wall - Ground floor	9.8500	0.0800	0.7880
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.5200	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.5393 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	31.6761 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.7167	26.5551	26.3967	25.6529	25.5137	24.8659	24.8659	24.7459	25.1154	25.5137	25.7953	26.0896	(38)
Heat transfer coeff	58.3927	58.2312	58.0728	57.3290	57.1898	56.5419	56.5419	56.4219	56.7915	57.1898	57.4713	57.7657	(39)
Average = Sum(39)m / 12 =												57.3283	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1747	1.1714	1.1682	1.1533	1.1505	1.1374	1.1374	1.1350	1.1425	1.1505	1.1561	1.1621	(40)
HLP (average)												1.1533	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6816	(42)
Hot water usage for mixer showers	52.4138	51.6261	50.4783	48.2822	46.6616	44.8542	43.8269	44.9660	46.2147	48.1552	50.3985	52.2130	(42a)
Hot water usage for baths	22.6629	22.3263	21.8523	20.9784	20.3241	19.5985	19.2065	19.6772	20.1896	20.9660	21.8580	22.5863	(42b)
Hot water usage for other uses	31.8509	30.6927	29.5345	28.3763	27.2181	26.0598	26.0598	27.2181	28.3763	29.5345	30.6927	31.8509	(42c)
Average daily hot water use (litres/day)												98.2912	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.9276	104.6452	101.8652	97.6369	94.2037	90.5125	89.0932	91.8612	94.7806	98.6558	102.9492	106.6502	(44)
Energy conte	169.3472	149.0133	156.5630	133.6601	126.8162	111.2957	107.7506	113.7434	116.8739	133.8749	146.6700	166.9884	(45)
Energy content (annual)										Total = Sum(45)m =		1632.5967	
Distribution loss (46)m = 0.15 x (45)m	25.4021	22.3520	23.4844	20.0490	19.0224	16.6943	16.1626	17.0615	17.5311	20.0812	22.0005	25.0483	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	215.9421	191.0990	203.1579	178.7519	173.4111	156.3875	154.3455	160.3383	161.9658	180.4699	191.7618	213.5833	(62)
WWHRS	-23.9614	-21.1917	-22.1907	-18.3748	-17.1246	-14.6537	-13.7355	-14.6063	-15.1612	-17.8734	-20.2484	-23.5177	(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	191.9807	169.9074	180.9672	160.3771	156.2865	141.7338	140.6100	145.7320	146.8045	162.5964	171.5134	190.0656	(64)
										Total per year (kWh/year) = Sum(64)m =		1958.5747	(64)
12Total per year (kWh/year)												1959	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	93.5839	83.2155	89.3331	80.5154	79.4423	73.0793	73.1030	75.0956	74.9341	81.7893	84.8412	92.7996	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	83.1241	92.0303	83.1241	85.8949	83.1241	85.8949	83.1241	83.1241	85.8949	83.1241	85.8949	83.1241	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	146.4808	148.0008	144.1704	136.0160	125.7225	116.0480	109.5849	108.0649	111.8953	120.0497	130.3432	140.0176	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	(71)
Water heating gains (Table 5)													

	125.7848	123.8326	120.0714	111.8270	106.7773	101.4990	98.2567	100.9349	104.0751	109.9319	117.8351	124.7306	(72)
Total internal gains													
	406.6131	415.0871	398.5894	384.9614	366.8474	351.6654	339.1892	340.3474	350.0888	364.3292	385.2967	399.0958	(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	
Northeast	2.5500	11.2829	0.6300	0.7000	0.7700	8.7929	(75)
Southwest	3.0600	36.7938	0.6300	0.7000	0.7700	34.4087	(79)

Solar gains	43.2016	76.5090	112.4408	152.3229	182.4831	186.3841	177.5216	154.2226	126.1264	86.6505	52.2775	36.6274	(83)
Total gains	449.8148	491.5962	511.0302	537.2842	549.3305	538.0496	516.7108	494.5700	476.2152	450.9797	437.5742	435.7233	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.7774	42.8961	43.0131	43.5712	43.6772	44.1777	44.1777	44.2716	43.9836	43.6772	43.4633	43.2418	
alpha	3.8518	3.8597	3.8675	3.9047	3.9118	3.9452	3.9452	3.9514	3.9322	3.9118	3.8976	3.8828	
util living area													
	0.9720	0.9588	0.9375	0.8836	0.7833	0.6190	0.4671	0.5044	0.7132	0.8898	0.9543	0.9749	(86)
MIT	19.5241	19.7201	20.0027	20.3964	20.7198	20.9202	20.9795	20.9721	20.8557	20.4662	19.9494	19.4985	(87)
Th 2	19.9403	19.9429	19.9455	19.9576	19.9598	19.9704	19.9704	19.9723	19.9663	19.9598	19.9553	19.9505	(88)
util rest of house													
	0.9657	0.9498	0.9232	0.8562	0.7324	0.5370	0.3642	0.4005	0.6373	0.8584	0.9427	0.9693	(89)
MIT 2	18.2544	18.5017	18.8559	19.3423	19.7118	19.9181	19.9620	19.9600	19.8611	19.4353	18.8014	18.2291	(90)
Living area fraction										fLA = Living area / (4) =		0.5279	(91)
MIT	18.9246	19.1448	19.4612	19.8987	20.2439	20.4471	20.4991	20.4942	20.3861	19.9795	19.4074	18.8992	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9246	19.1448	19.4612	19.8987	20.2439	20.4471	20.4991	20.4942	20.3861	19.9795	19.4074	18.8992	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9581	0.9413	0.9153	0.8544	0.7474	0.5763	0.4180	0.4545	0.6700	0.8591	0.9352	0.9620	(94)
Useful gains	430.9538	462.7414	467.7635	459.0773	410.5452	310.0997	216.0061	224.7816	319.0548	387.4402	409.1993	419.1809	(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													
	853.9704	829.4931	752.6955	630.5429	488.6246	330.6053	220.4610	231.0053	356.9982	536.4088	707.3228	849.1077	(97)
Space heating kWh													
	314.7244	246.4572	211.9894	123.4552	58.0911	0.0000	0.0000	0.0000	0.0000	110.8327	214.6489	319.8655	(98a)
Space heating requirement - total per year (kWh/year)												1600.0643	
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													
	314.7244	246.4572	211.9894	123.4552	58.0911	0.0000	0.0000	0.0000	0.0000	110.8327	214.6489	319.8655	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1600.0643	
Space heating per m2											(98c) / (4) =	32.1880	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	314.7244	246.4572	211.9894	123.4552	58.0911	0.0000	0.0000	0.0000	0.0000	110.8327	214.6489	319.8655	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	340.9798	267.0175	229.6743	133.7543	62.9372	0.0000	0.0000	0.0000	0.0000	120.0787	232.5557	346.5498	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	191.9807	169.9074	180.9672	160.3771	156.2865	141.7338	140.6100	145.7320	146.8045	162.5964	171.5134	190.0656	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.1610	84.8929	84.4155	83.4801	82.0535	79.8000	79.8000	79.8000	79.8000	83.2188	84.5640	85.2177	(217)
Fuel for water heating, kWh/month													
	225.4327	200.1431	214.3766	192.1142	190.4690	177.6113	176.2030	182.6216	183.9656	195.3842	202.8207	223.0354	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	17.2715	13.8559	12.4757	9.1402	7.0602	5.7682	6.4405	8.3716	10.8739	14.2672	16.1147	17.7516	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.1492	-25.0800	-37.3857	-43.6578	-48.5121	-45.8379	-45.3189	-42.1020	-36.6239	-29.4426	-19.1870	-14.7260	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													

(233b)m	-7.1125	-15.2024	-30.6572	-46.6823	-62.3304	-62.8171	-62.0363	-52.2108	-37.8845	-21.9024	-9.5513	-5.6034	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1733.5475	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2364.1775	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	139.3913	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-819.0138	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3504.1025	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1733.5475	0.2100	364.0450	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2364.1775	0.2100	496.4773	(264)
Space and water heating			860.5222	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	139.3913	0.1443	20.1185	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-405.0230	0.1338	-54.1910	
PV Unit electricity exported	-413.9907	0.1255	-51.9600	
Total			-106.1510	(269)
Total CO2, kg/year			786.4190	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.8200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1733.5475	1.1300	1958.9087	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2364.1775	1.1300	2671.5205	(278)
Space and water heating			4630.4292	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	139.3913	1.5338	213.8030	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-405.0230	1.4944	-605.2858	
PV Unit electricity exported	-413.9907	0.4607	-190.7218	
Total			-796.0076	(283)
Total Primary energy kWh/year			4178.3254	(286)
Target Primary Energy Rate (TPER)			84.0500	(287)

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)	
Main dwelling						
Ground floor	49.7100	(1b)	x 2.7500	(2b) =	136.7025	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		136.7025	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1463	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3963	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3369	(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													
	0.4295	0.4211	0.4127	0.3705	0.3621	0.3200	0.3200	0.3116	0.3369	0.3621	0.3790	0.3958	(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	0.5922	0.5887	0.5851	0.5687	0.5656	0.5512	0.5512	0.5485	0.5567	0.5656	0.5718	0.5783	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Windows			5.6100	1.1450	6.4237			(27)
Solid door			2.3300	1.2000	2.7960			(26)
Ground floor			49.7100	0.1200	5.9652	75.0000	3728.2500	(28a)
External Wall 1	57.5000	7.9400	49.5600	0.1800	8.9208	70.0000	3469.2000	(29a)
Total net area of external elements Aum(A, m2)			107.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.1057			(33)
Main dwelling								
Party Ceiling 1			49.7100			30.0000	1491.3000	(32b)
Timber			33.7400			9.0000	303.6600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8992.4100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		180.8974 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	4.0800	0.0500	0.2040
E3 Sill	2.7200	0.0240	0.0653
E4 Jamb	11.7000	0.0190	0.2223
E5 Ground floor (normal)	20.1700	0.0310	0.6253
E7 Party floor between dwellings (in blocks of flats)	30.0200	0.0320	0.9606
E16 Corner (normal)	8.2800	0.0400	0.3312
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0820	-0.2255
P1 Party wall - Ground floor	9.8500	0.3200	3.1520
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.2000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.3352 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	29.4409 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.7167	26.5551	26.3967	25.6529	25.5137	24.8659	24.8659	24.7459	25.1154	25.5137	25.7953	26.0896	(38)
Heat transfer coeff	56.1575	55.9960	55.8376	55.0937	54.9546	54.3067	54.3067	54.1867	54.5563	54.9546	55.2361	55.5305	(39)
Average = Sum(39)m / 12 =												55.0931	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1297	1.1265	1.1233	1.1083	1.1055	1.0925	1.0925	1.0901	1.0975	1.1055	1.1112	1.1171	(40)
HLP (average)												1.1083	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.6816 (42)

Hot water usage for mixer showers

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

22.6629	22.3263	21.8523	20.9784	20.3241	19.5985	19.2065	19.6772	20.1896	20.9660	21.8580	22.5863	(42b)

Hot water usage for other uses

31.8509	30.6927	29.5345	28.3763	27.2181	26.0598	26.0598	27.2181	28.3763	29.5345	30.6927	31.8509	(42c)

Average daily hot water use (litres/day)		49.9674 (43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
54.5138	53.0190	51.3868	49.3547	47.5421	45.6583	45.2664	46.8952	48.5659	50.5005	52.5507	54.4372	(44)
86.3365	75.4984	78.9796	67.5641	64.0008	56.1422	54.7457	58.0661	59.8866	68.5287	74.8680	85.2355	(45)

Energy content (annual)	Total = Sum(45)m =	829.8524

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

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

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)
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)
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

73.3861	64.1736	67.1327	57.4295	54.4007	47.7209	46.5339	49.3562	50.9036	58.2494	63.6378	72.4502	(62)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

73.3861	64.1736	67.1327	57.4295	54.4007	47.7209	46.5339	49.3562	50.9036	58.2494	63.6378	72.4502	(64)

	Total per year (kWh/year) = Sum(64)m =	705.3745 (64)
12Total per year (kWh/year)		705 (64)

Electric shower(s)

41.9747	37.3998	40.8392	38.9723	39.7036	37.8734	39.1359	39.7036	38.9723	40.8392	40.0712	41.9747	(64a)

	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	477.4601 (64a)

Heat gains from water heating, kWh/month

28.8402	25.3934	26.9930	24.1005	23.5261	21.3986	21.4174	22.2650	22.4690	24.7722	25.9273	28.6062	(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	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	83.1241	92.0303	83.1241	85.8949	83.1241	85.8949	83.1241	83.1241	85.8949	83.1241	85.8949	83.1241	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	146.4808	148.0008	144.1704	136.0160	125.7225	116.0480	109.5849	108.0649	111.8953	120.0497	130.3432	140.0176	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	(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)													
	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	(71)
Water heating gains (Table 5)													
	38.7637	37.7877	36.2809	33.4729	31.6211	29.7202	28.7869	29.9260	31.2069	33.2959	36.0101	38.4492	(72)
Total internal gains													
	316.5921	326.0423	311.7989	303.6072	288.6911	279.8867	269.7194	269.3385	277.2206	284.6932	300.4717	309.8145	(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	
Northeast	2.5500	11.2829	0.6300	0.7000	0.7700	8.7929	(75)
Southwest	3.0600	36.7938	0.6300	0.7000	0.7700	34.4087	(79)

Solar gains	43.2016	76.5090	112.4408	152.3229	182.4831	186.3841	177.5216	154.2226	126.1264	86.6505	52.2775	36.6274	(83)
Total gains	359.7937	402.5513	424.2397	455.9301	471.1742	466.2708	447.2410	423.5611	403.3470	371.3437	352.7492	346.4419	(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	44.4801	44.6084	44.7349	45.3389	45.4538	45.9960	45.9960	46.0978	45.7856	45.4538	45.2221	44.9824	
alpha	3.9653	3.9739	3.9823	4.0226	4.0303	4.0664	4.0664	4.0732	4.0524	4.0303	4.0148	3.9988	
util living area													
	0.9861	0.9771	0.9622	0.9195	0.8324	0.6712	0.5140	0.5585	0.7735	0.9304	0.9757	0.9879	(86)
MIT	19.3835	19.5899	19.8853	20.3106	20.6685	20.9032	20.9746	20.9645	20.8199	20.3698	19.8204	19.3576	(87)
Th 2	19.9766	19.9793	19.9819	19.9941	19.9963	20.0070	20.0070	20.0090	20.0029	19.9963	19.9917	19.9869	(88)
util rest of house													
	0.9828	0.9717	0.9528	0.8986	0.7878	0.5904	0.4069	0.4508	0.7033	0.9081	0.9690	0.9851	(89)
MIT 2	18.5162	18.7218	19.0140	19.4325	19.7601	19.9557	19.9985	19.9961	19.8957	19.4968	18.9607	18.4982	(90)
Living area fraction									fLA = Living area / (4) =			0.5279	(91)
MIT	18.9740	19.1801	19.4739	19.8960	20.2396	20.4559	20.5138	20.5072	20.3835	19.9576	19.4145	18.9518	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9740	19.1801	19.4739	19.8960	20.2396	20.4559	20.5138	20.5072	20.3835	19.9576	19.4145	18.9518	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9664	0.9471	0.8963	0.7996	0.6286	0.4628	0.5066	0.7321	0.9071	0.9642	0.9813	(94)
Useful gains	352.0869	389.0348	401.8075	408.6275	376.7484	293.0963	207.0005	214.5726	295.2977	336.8545	340.1163	339.9519	(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													
	824.0555	799.6255	724.4328	605.8122	469.2904	318.0122	212.5432	222.5582	342.8065	514.2448	680.2049	819.1743	(97)
Space heating kWh													
	351.1446	275.9169	240.0332	141.9730	68.8513	0.0000	0.0000	0.0000	0.0000	131.9784	244.8638	356.5415	(98a)
Space heating requirement - total per year (kWh/year)												1811.3026	
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													
	351.1446	275.9169	240.0332	141.9730	68.8513	0.0000	0.0000	0.0000	0.0000	131.9784	244.8638	356.5415	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1811.3026	
Space heating per m2											(98c) / (4) =	36.4374	(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	510.4830	401.8696	411.8191	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8010	0.8721	0.8462	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	408.9066	350.4645	348.4869	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	508.4531	488.1003	462.0945	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	71.6735	102.4010	84.5240	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	17.9184	25.6002	21.1310	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												64.6496	(107)
Energy for space heating												36.4374	(99)
Energy for space cooling												1.3005	(108)
Total												37.7379	(109)
Fabric Energy Efficiency (DFEE)												37.7	(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)	
Main dwelling						
Ground floor	49.7100	(1b)	x 2.7500	(2b) =	136.7025	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		136.7025	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1463 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3963 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3369 (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	0.4295	0.4211	0.4127	0.3705	0.3621	0.3200	0.3200	0.3116	0.3369	0.3621	0.3790	0.3958	(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	0.5922	0.5887	0.5851	0.5687	0.5656	0.5512	0.5512	0.5485	0.5567	0.5656	0.5718	0.5783	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.3300	1.0000	2.3300			(26)
TER Opening Type			5.6100	1.1450	6.4237			(27)
Ground floor			49.7100	0.1300	6.4623			(28a)
External Wall 1	57.5000	7.9400	49.5600	0.1800	8.9208			(29a)
Total net area of external elements Aum(A, m2)			107.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.1368			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 180.8974 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	4.0800	0.0500	0.2040
E3 Sill	2.7200	0.0500	0.1360
E4 Jamb	11.7000	0.0500	0.5850
E5 Ground floor (normal)	20.1700	0.1600	3.2272
E7 Party floor between dwellings (in blocks of flats)	30.0200	0.0700	2.1014
E16 Corner (normal)	8.2800	0.0900	0.7452
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0900	-0.2475
P1 Party wall - Ground floor	9.8500	0.0800	0.7880
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.5200	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.5393 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	31.6761 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.7167	26.5551	26.3967	25.6529	25.5137	24.8659	24.8659	24.7459	25.1154	25.5137	25.7953	26.0896	(38)
Heat transfer coeff	58.3927	58.2312	58.0728	57.3290	57.1898	56.5419	56.5419	56.4219	56.7915	57.1898	57.4713	57.7657	(39)
Average = Sum(39)m / 12 =												57.3283	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1747	1.1714	1.1682	1.1533	1.1505	1.1374	1.1374	1.1350	1.1425	1.1505	1.1561	1.1621	(40)
HLP (average)												1.1533	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6816 (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
22.6629 22.3263 21.8523 20.9784 20.3241 19.5985 19.2065 19.6772 20.1896 20.9660 21.8580 22.5863 (42b)
Hot water usage for other uses
31.8509 30.6927 29.5345 28.3763 27.2181 26.0598 26.0598 27.2181 28.3763 29.5345 30.6927 31.8509 (42c)
Average daily hot water use (litres/day) 49.9674 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	54.5138	53.0190	51.3868	49.3547	47.5421	45.6583	45.2664	46.8952	48.5659	50.5005	52.5507	54.4372	(44)
Energy conte	86.3365	75.4984	78.9796	67.5641	64.0008	56.1422	54.7457	58.0661	59.8866	68.5287	74.8680	85.2355	(45)
Energy content (annual)										Total = Sum(45)m =		829.8524	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
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													
	73.3861	64.1736	67.1327	57.4295	54.4007	47.7209	46.5339	49.3562	50.9036	58.2494	63.6378	72.4502	(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													
	73.3861	64.1736	67.1327	57.4295	54.4007	47.7209	46.5339	49.3562	50.9036	58.2494	63.6378	72.4502	(64)
										Total per year (kWh/year) = Sum(64)m =		705.3745	(64)
12Total per year (kWh/year)												705	(64)
Electric shower(s)													
	41.9747	37.3998	40.8392	38.9723	39.7036	37.8734	39.1359	39.7036	38.9723	40.8392	40.0712	41.9747	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 477.4601 (64a)													
Heat gains from water heating, kWh/month													
	28.8402	25.3934	26.9930	24.1005	23.5261	21.3986	21.4174	22.2650	22.4690	24.7722	25.9273	28.6062	(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	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	84.0783	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	83.1241	92.0303	83.1241	85.8949	83.1241	85.8949	83.1241	83.1241	85.8949	83.1241	85.8949	83.1241	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	146.4808	148.0008	144.1704	136.0160	125.7225	116.0480	109.5849	108.0649	111.8953	120.0497	130.3432	140.0176	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	31.4078	(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)													
	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	(71)
Water heating gains (Table 5)													
	38.7637	37.7877	36.2809	33.4729	31.6211	29.7202	28.7869	29.9260	31.2069	33.2959	36.0101	38.4492	(72)
Total internal gains													
	316.5921	326.0423	311.7989	303.6072	288.6911	279.8867	269.7194	269.3385	277.2206	284.6932	300.4717	309.8145	(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	
Northeast	2.5500	11.2829	0.6300	0.7000	0.7700	8.7929	(75)
Southwest	3.0600	36.7938	0.6300	0.7000	0.7700	34.4087	(79)

Solar gains	43.2016	76.5090	112.4408	152.3229	182.4831	186.3841	177.5216	154.2226	126.1264	86.6505	52.2775	36.6274	(83)
Total gains	359.7937	402.5513	424.2397	455.9301	471.1742	466.2708	447.2410	423.5611	403.3470	371.3437	352.7492	346.4419	(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	42.7774	42.8961	43.0131	43.5712	43.6772	44.1777	44.1777	44.2716	43.9836	43.6772	43.4633	43.2418	
alpha	3.8518	3.8597	3.8675	3.9047	3.9118	3.9452	3.9452	3.9514	3.9322	3.9118	3.8976	3.8828	
util living area													
	0.9863	0.9778	0.9637	0.9237	0.8416	0.6866	0.5304	0.5752	0.7856	0.9340	0.9765	0.9881	(86)
MIT	19.2982	19.5066	19.8096	20.2485	20.6266	20.8846	20.9680	20.9559	20.7927	20.3159	19.7479	19.2716	(87)
Th 2	19.9403	19.9429	19.9455	19.9576	19.9598	19.9704	19.9704	19.9723	19.9663	19.9598	19.9553	19.9505	(88)
util rest of house													
	0.9831	0.9725	0.9545	0.9033	0.7974	0.6037	0.4175	0.4623	0.7150	0.9122	0.9699	0.9853	(89)
MIT 2	18.4050	18.6127	18.9127	19.3452	19.6932	19.9091	19.9598	19.9564	19.8425	19.4175	18.8622	18.3862	(90)
Living area fraction										fLA = Living area / (4) =		0.5279	(91)
MIT	18.8765	19.0845	19.3862	19.8220	20.1859	20.4240	20.4920	20.4840	20.3441	19.8917	19.3297	18.8535	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8765	19.0845	19.3862	19.8220	20.1859	20.4240	20.4920	20.4840	20.3441	19.8917	19.3297	18.8535	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9787	0.9670	0.9485	0.9002	0.8080	0.6422	0.4763	0.5205	0.7430	0.9105	0.9649	0.9814	(94)
Useful gains	352.1424	389.2703	402.4014	410.4161	380.7115	299.4197	213.0384	220.4584	299.6852	338.0967	340.3622	339.9833	(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													
	851.1607	825.9819	748.3353	626.1478	485.3072	329.2990	220.0607	230.4271	354.6104	531.3913	702.8598	846.4718	(97)

Space heating kWh

371.2696	293.4701	257.3748	155.3268	77.8192	0.0000	0.0000	0.0000	0.0000	143.8112	260.9983	376.8274	(98a)

Space heating requirement - total per year (kWh/year) 1936.8974
Solar heating kWh

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)

Solar heating contribution - total per year (kWh/year) 0.0000
Space heating kWh

371.2696	293.4701	257.3748	155.3268	77.8192	0.0000	0.0000	0.0000	0.0000	143.8112	260.9983	376.8274	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1936.8974
Space heating per m2 (98c) / (4) = 38.9639 (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	531.4940	418.4102	428.8067	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7797	0.8542	0.8267	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	414.4227	357.3979	354.5041	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	508.4531	488.1003	462.0945	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	67.7019	97.2426	80.0472	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	16.9255	24.3106	20.0118	0.0000	0.0000	0.0000	0.0000	(107)

Space cooling requirement 61.2479 (107)
Energy for space heating 38.9639 (99)
Energy for space cooling 1.2321 (108)
Total 40.1960 (109)
Fabric Energy Efficiency (TFEE) 40.2 (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)	
Main dwelling						
Ground floor	49.7100	(1b)	x 2.7500	(2b) =	136.7025	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		136.7025	(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		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(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	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(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) = 83.7000 (23c)

Effective ac	0.3524	0.3471	0.3418	0.3152	0.3099	0.2834	0.2834	0.2781	0.2940	0.3099	0.3206	0.3312	(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	
Main dwelling								
Windows			5.6100	1.1450	6.4237			(27)
Solid door			2.3300	1.2000	2.7960			(26)

Ground floor			49.7100	0.1200	5.9652	75.0000	3728.2500 (28a)
External Wall 1	57.5000	7.9400	49.5600	0.1800	8.9208	70.0000	3469.2000 (29a)
Total net area of external elements Aum(A, m2)			107.2100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.1057		(33)
Main dwelling							
Party Ceiling 1			49.7100			30.0000	1491.3000 (32b)
Timber			33.7400			9.0000	303.6600 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 8992.4100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	180.8974 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	4.0800	0.0500	0.2040
E3 Sill	2.7200	0.0240	0.0653
E4 Jamb	11.7000	0.0190	0.2223
E5 Ground floor (normal)	20.1700	0.0310	0.6253
E7 Party floor between dwellings (in blocks of flats)	30.0200	0.0320	0.9606
E16 Corner (normal)	8.2800	0.0400	0.3312
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0820	-0.2255
P1 Party wall - Ground floor	9.8500	0.3200	3.1520
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.2200	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.3352 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 29.4409 (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	15.8991	15.6594	15.4198	14.2215	13.9818	12.7836	12.7836	12.5439	13.2629	13.9818	14.4612	14.9405	(38)
Heat transfer coeff	45.3400	45.1003	44.8606	43.6624	43.4227	42.2244	42.2244	41.9848	42.7037	43.4227	43.9020	44.3813	(39)
Average = Sum(39)m / 12 =												43.6024	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9121	0.9073	0.9024	0.8783	0.8735	0.8494	0.8494	0.8446	0.8591	0.8735	0.8832	0.8928	(40)
HLP (average)												0.8771	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6816	(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													
	22.6629	22.3263	21.8523	20.9784	20.3241	19.5985	19.2065	19.6772	20.1896	20.9660	21.8580	22.5863	(42b)
Hot water usage for other uses													
	31.8509	30.6927	29.5345	28.3763	27.2181	26.0598	26.0598	27.2181	28.3763	29.5345	30.6927	31.8509	(42c)
Average daily hot water use (litres/day)												49.9674	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	54.5138	53.0190	51.3868	49.3547	47.5421	45.6583	45.2664	46.8952	48.5659	50.5005	52.5507	54.4372	(44)
Energy conte	86.3365	75.4984	78.9796	67.5641	64.0008	56.1422	54.7457	58.0661	59.8866	68.5287	74.8680	85.2355	(45)
Energy content (annual)										Total = Sum(45)m =		829.8524	
Distribution loss (46)m = 0.15 x (45)m													
	12.9505	11.3248	11.8469	10.1346	9.6001	8.4213	8.2119	8.7099	8.9830	10.2793	11.2302	12.7853	(46)
Water storage loss (or HIU loss):													
Store volume												90.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9000	(55)
Total storage loss													
	27.9000	25.2000	27.9000	27.0000	27.9000	27.0000	27.9000	27.9000	27.0000	27.9000	27.0000	27.9000	(56)
If cylinder contains dedicated solar storage													
	27.9000	25.2000	27.9000	27.0000	27.9000	27.0000	27.9000	27.9000	27.0000	27.9000	27.0000	27.9000	(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													
	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(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													
	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(64)
										Total per year (kWh/year) = Sum(64)m =		1158.3524	(64)
Electric shower(s)													
	41.9747	37.3998	40.8392	38.9723	39.7036	37.8734	39.1359	39.7036	38.9723	40.8392	40.0712	41.9747	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		477.4601	(64a)
Heat gains from water heating, kWh/month													
	61.5206	54.6132	58.7905	53.8082	53.5262	49.7356	50.3069	51.5529	51.2554	55.3156	56.5114	61.1545	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.5633	17.3759	14.1311	10.6981	7.9970	6.7514	7.2951	9.4825	12.7273	16.1603	18.8614	20.1070	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	218.6280	220.8967	215.1797	203.0089	187.6455	173.2060	163.5596	161.2909	167.0079	179.1787	194.5421	208.9816	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	(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)													
	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	(71)
Water heating gains (Table 5)													
	82.6890	81.2696	79.0195	74.7335	71.9438	69.0773	67.6168	69.2915	71.1880	74.3489	78.4881	82.1969	(72)
Total internal gains													
	401.2825	399.9445	388.7326	368.8429	347.9885	329.4369	318.8738	320.4671	331.3255	350.0901	372.2939	391.6877	(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	
Northeast	2.5500	11.2829	0.6300	0.7000	0.7700	8.7929	(75)
Southwest	3.0600	36.7938	0.6300	0.7000	0.7700	34.4087	(79)

Solar gains	43.2016	76.5090	112.4408	152.3229	182.4831	186.3841	177.5216	154.2226	126.1264	86.6505	52.2775	36.6274	(83)
Total gains	444.4842	476.4535	501.1734	521.1657	530.4716	515.8211	496.3954	474.6897	457.4519	436.7406	424.5714	428.3152	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.0925	55.3853	55.6811	57.2093	57.5250	59.1575	59.1575	59.4952	58.4935	57.5250	56.8970	56.2825	
alpha	4.6728	4.6924	4.7121	4.8140	4.8350	4.9438	4.9438	4.9663	4.8996	4.8350	4.7931	4.7522	
util living area	0.9640	0.9476	0.9133	0.8336	0.7002	0.5135	0.3725	0.4041	0.6154	0.8422	0.9391	0.9681	(86)
MIT	20.0397	20.1968	20.4355	20.7234	20.9045	20.9840	20.9973	20.9961	20.9611	20.7529	20.3776	20.0286	(87)
Th 2	20.1572	20.1613	20.1654	20.1859	20.1901	20.2107	20.2107	20.2149	20.2024	20.1901	20.1818	20.1736	(88)
util rest of house	0.9568	0.9375	0.8967	0.8040	0.6535	0.4539	0.3065	0.3364	0.5535	0.8083	0.9258	0.9618	(89)
MIT 2	19.0563	19.2545	19.5505	19.9072	20.1068	20.2002	20.2095	20.2130	20.1744	19.9501	19.4975	19.0550	(90)
Living area fraction									fLA = Living area / (4) =			0.5279	(91)
MIT	19.5754	19.7519	20.0177	20.3381	20.5279	20.6140	20.6254	20.6264	20.5897	20.3739	19.9621	19.5689	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5754	19.7519	20.0177	20.3381	20.5279	20.6140	20.6254	20.6264	20.5897	20.3739	19.9621	19.5689	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9509	0.9318	0.8934	0.8099	0.6736	0.4847	0.3413	0.3720	0.5842	0.8165	0.9218	0.9562	(94)
Useful gains	422.6809	443.9670	447.7689	422.0837	357.3188	249.9981	169.4094	176.6020	267.2445	356.6156	391.3516	409.5647	(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	692.5873	669.8259	606.4111	499.4123	383.3313	253.9357	169.9691	177.4427	277.1334	424.4071	564.6716	682.0930	(97)
Space heating kWh	200.8103	151.7771	118.0299	55.6766	19.3533	0.0000	0.0000	0.0000	0.0000	50.4368	124.7904	202.7611	(98a)
Space heating requirement - total per year (kWh/year)												923.6355	
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	200.8103	151.7771	118.0299	55.6766	19.3533	0.0000	0.0000	0.0000	0.0000	50.4368	124.7904	202.7611	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												923.6355	
Space heating per m2											(98c) / (4) =	18.5805	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	200.8103	151.7771	118.0299	55.6766	19.3533	0.0000	0.0000	0.0000	0.0000	50.4368	124.7904	202.7611	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	200.8103	151.7771	118.0299	55.6766	19.3533	0.0000	0.0000	0.0000	0.0000	50.4368	124.7904	202.7611	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.7254	7.8810	8.7254	8.4439	8.7254	8.4439	8.7254	8.7254	8.4439	8.7254	8.4439	8.7254	(231)
Lighting	17.1236	13.7372	12.3688	9.0619	6.9997	5.7188	6.3854	8.2999	10.7808	14.1450	15.9767	17.5996	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.3061	-31.0545	-47.9637	-56.9830	-63.7383	-59.8635	-59.2794	-54.3628	-45.8242	-36.2538	-22.9687	-17.2878	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-4.7371	-10.7355	-23.2094	-38.4030	-54.1031	-55.9933	-55.0464	-45.5241	-32.4073	-17.1691	-6.7362	-3.6691	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												923.6355	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	100.0000	
Water heating fuel used	1158.3524	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6160)		
mechanical ventilation fans (SFP = 0.6160)	102.7347	(230a)
Total electricity for the above, kWh/year	102.7347	(231)
Electricity for lighting (calculated in Appendix L)	138.1976	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-863.6197	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1936.7605	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	923.6355	16.4900	152.3075	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1158.3524	16.4900	191.0123	(247)
Energy for instantaneous electric shower(s)	477.4601	16.4900	78.7332	(247a)
Pumps, fans and electric keep-hot	102.7347	16.4900	16.9409	(249)
Energy for lighting	138.1976	16.4900	22.7888	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.8859	16.4900	0.0000	
PV Unit electricity exported	-347.7338	5.5900	0.0000	
Total			0.0000	(252)
Total energy cost			461.7827	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.7553	(257)
SAP value		71.5470	
SAP rating (Section 12)		72	(258)
SAP band		C	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	923.6355	0.1563	144.3442	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1158.3524	0.1408	163.0550	(264)
Energy for instantaneous electric shower(s)	477.4601	0.1391	66.4253	(264a)
Space and water heating			307.3992	(265)
Pumps, fans and electric keep-hot	102.7347	0.1387	14.2506	(267)
Energy for lighting	138.1976	0.1443	19.9462	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.8859	0.1334	-68.8386	
PV Unit electricity exported	-347.7338	0.1234	-42.9135	
Total			-111.7521	(269)
Total CO2, kg/year			296.2691	(272)
CO2 emissions per m2			5.9600	(273)
EI value			95.8083	
EI rating			96	(274)
EI band			A	

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	49.7100	(1b)	x 2.7500	(2b) =	136.7025	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		136.7025	(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		5.0000	(17)
Infiltration rate		0.2500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	6.4000	5.8000	5.5000	4.8000	4.9000	4.5000	4.8000	4.7000	5.0000	5.5000	5.6000	6.0000	(22)
Wind factor	1.6000	1.4500	1.3750	1.2000	1.2250	1.1250	1.2000	1.1750	1.2500	1.3750	1.4000	1.5000	(22a)
Adj infilt rate	0.3400	0.3081	0.2922	0.2550	0.2603	0.2391	0.2550	0.2497	0.2656	0.2922	0.2975	0.3187	(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) =		83.7000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.4215	0.3896	0.3737	0.3365	0.3418	0.3206	0.3365	0.3312	0.3471	0.3737	0.3790	0.4002	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Windows			5.6100	1.1450	6.4237			(27)
Solid door			2.3300	1.2000	2.7960			(26)
Ground floor			49.7100	0.1200	5.9652	75.0000	3728.2500	(28a)
External Wall 1	57.5000	7.9400	49.5600	0.1800	8.9208	70.0000	3469.2000	(29a)
Total net area of external elements Aum(A, m2)			107.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.1057			(33)
Main dwelling								
Party Ceiling 1			49.7100			30.0000	1491.3000	(32b)
Timber			33.7400			9.0000	303.6600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8992.4100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		180.8974 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	4.0800	0.0500	0.2040
E3 Sill	2.7200	0.0240	0.0653
E4 Jamb	11.7000	0.0190	0.2223
E5 Ground floor (normal)	20.1700	0.0310	0.6253
E7 Party floor between dwellings (in blocks of flats)	30.0200	0.0320	0.9606
E16 Corner (normal)	8.2800	0.0400	0.3312
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0820	-0.2255
P1 Party wall - Ground floor	9.8500	0.3200	3.1520
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.5200	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		5.3352 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	29.4409 (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	19.0146	17.5767	16.8577	15.1801	15.4198	14.4612	15.1801	14.9405	15.6594	16.8577	17.0974	18.0560	(38)
Heat transfer coeff	48.4555	47.0175	46.2986	44.6210	44.8606	43.9020	44.6210	44.3813	45.1003	46.2986	46.5382	47.4969	(39)
Average = Sum(39)m / 12 =												45.7993	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9748	0.9458	0.9314	0.8976	0.9024	0.8832	0.8976	0.8928	0.9073	0.9314	0.9362	0.9555	(40)
HLP (average)												0.9213	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.6816 (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	22.6629	22.3263	21.8523	20.9784	20.3241	19.5985	19.2065	19.6772	20.1896	20.9660	21.8580	22.5863	(42b)
Hot water usage for other uses	31.8509	30.6927	29.5345	28.3763	27.2181	26.0598	26.0598	27.2181	28.3763	29.5345	30.6927	31.8509	(42c)
Average daily hot water use (litres/day)												49.9674	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	54.5138	53.0190	51.3868	49.3547	47.5421	45.6583	45.2664	46.8952	48.5659	50.5005	52.5507	54.4372	(44)
Energy conte	86.3365	75.4984	78.9796	67.5641	64.0008	56.1422	54.7457	58.0661	59.8866	68.5287	74.8680	85.2355	(45)
Energy content (annual)										Total = Sum(45)m =		829.8524	
Distribution loss (46)m = 0.15 x (45)m	12.9505	11.3248	11.8469	10.1346	9.6001	8.4213	8.2119	8.7099	8.9830	10.2793	11.2302	12.7853	(46)

Water storage loss (or HIU loss):		
Store volume		90.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.5000 (48)
Temperature factor from Table 2b		0.6000 (49)
Enter (49) or (54) in (55)		0.9000 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	27.9000	25.2000	27.9000	27.0000	27.9000	27.0000	27.9000	27.9000	27.0000	27.9000	27.0000	27.9000	(56)
If cylinder contains dedicated solar storage	27.9000	25.2000	27.9000	27.0000	27.9000	27.0000	27.9000	27.9000	27.0000	27.9000	27.0000	27.9000	(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													
	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(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													
	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(64)
										Total per year (kWh/year) = Sum(64)m =		1158.3524	(64)
Electric shower(s)													
	41.9747	37.3998	40.8392	38.9723	39.7036	37.8734	39.1359	39.7036	38.9723	40.8392	40.0712	41.9747	(64a)
Heat gains from water heating, kWh/month													
	61.5206	54.6132	58.7905	53.8082	53.5262	49.7356	50.3069	51.5529	51.2554	55.3156	56.5114	61.1545	(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	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.5633	17.3759	14.1311	10.6981	7.9970	6.7514	7.2951	9.4825	12.7273	16.1603	18.8614	20.1070	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	218.6280	220.8967	215.1797	203.0089	187.6455	173.2060	163.5596	161.2909	167.0079	179.1787	194.5421	208.9816	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	(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)													
	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	(71)
Water heating gains (Table 5)													
	82.6890	81.2696	79.0195	74.7335	71.9438	69.0773	67.6168	69.2915	71.1880	74.3489	78.4881	82.1969	(72)
Total internal gains													
	401.2825	399.9445	388.7326	368.8429	347.9885	329.4369	318.8738	320.4671	331.3255	350.0901	372.2939	391.6877	(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	
Northeast	2.5500	14.1923	0.6300	0.7000	0.7700	11.0602	(75)
Southwest	3.0600	43.9597	0.6300	0.7000	0.7700	41.1100	(79)

Solar gains	52.1702	79.8936	119.8990	176.9477	201.0033	217.2123	206.5018	179.6424	145.8945	98.2043	61.8608	41.4532	(83)
Total gains	453.4528	479.8381	508.6316	545.7906	548.9918	546.6492	525.3756	500.1095	477.2201	448.2944	434.1547	433.1410	(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	51.5502	53.1268	53.9518	55.9802	55.6811	56.8970	55.9802	56.2825	55.3853	53.9518	53.6740	52.5907	
alpha	4.4367	4.5418	4.5968	4.7320	4.7121	4.7931	4.7320	4.7522	4.6924	4.5968	4.5783	4.5060	
util living area													
	0.9594	0.9466	0.9068	0.8030	0.6511	0.4593	0.3133	0.3098	0.5329	0.7949	0.9213	0.9618	(86)
MIT	20.0211	20.1637	20.4430	20.7673	20.9300	20.9896	20.9986	20.9988	20.9787	20.8111	20.4451	20.0488	(87)
Th 2	20.1044	20.1287	20.1409	20.1695	20.1654	20.1818	20.1695	20.1736	20.1613	20.1409	20.1368	20.1206	(88)
util rest of house													
	0.9509	0.9360	0.8886	0.7692	0.5986	0.3971	0.2435	0.2371	0.4617	0.7495	0.9031	0.9537	(89)
MIT 2	18.9943	19.1889	19.5401	19.9411	20.1082	20.1757	20.1691	20.1733	20.1484	19.9710	19.5451	19.0418	(90)
Living area fraction										fLA = Living area / (4) =		0.5279	(91)
MIT	19.5363	19.7035	20.0167	20.3772	20.5420	20.6053	20.6069	20.6090	20.5867	20.4145	20.0202	19.5734	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5363	19.7035	20.0167	20.3772	20.5420	20.6053	20.6069	20.6090	20.5867	20.4145	20.0202	19.5734	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9444	0.9300	0.8857	0.7781	0.6229	0.4296	0.2804	0.2755	0.4983	0.7648	0.9003	0.9476	(94)
Useful gains	428.2632	446.2290	450.4996	424.6808	341.9538	234.8239	147.2985	137.7625	237.8123	342.8721	390.8734	410.4392	(95)
Ext temp.	5.0000	5.2000	6.9000	9.4000	12.5000	15.2000	17.3000	17.5000	15.2000	11.9000	8.3000	5.3000	(96)
Heat loss rate W													
	704.3638	681.9175	607.2834	489.8150	360.7702	237.3039	147.5593	137.9824	242.9414	394.2074	545.4371	677.9395	(97)
Space heating kWh													
	205.4189	158.3827	116.6472	46.8967	13.9994	0.0000	0.0000	0.0000	0.0000	38.1935	111.2859	199.0202	(98a)
Space heating requirement - total per year (kWh/year)												889.8444	
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													
	205.4189	158.3827	116.6472	46.8967	13.9994	0.0000	0.0000	0.0000	0.0000	38.1935	111.2859	199.0202	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												889.8444	
Space heating per m2											(98c) / (4) =	17.9007	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	205.4189	158.3827	116.6472	46.8967	13.9994	0.0000	0.0000	0.0000	0.0000	38.1935	111.2859	199.0202	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	205.4189	158.3827	116.6472	46.8967	13.9994	0.0000	0.0000	0.0000	0.0000	38.1935	111.2859	199.0202	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.7254	7.8810	8.7254	8.4439	8.7254	8.4439	8.7254	8.7254	8.4439	8.7254	8.4439	8.7254	(231)
Lighting	17.1236	13.7372	12.3688	9.0619	6.9997	5.7188	6.3854	8.2999	10.7808	14.1450	15.9767	17.5996	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.3148	-32.6006	-50.7236	-63.1404	-67.5561	-65.9577	-65.2721	-60.2410	-51.0233	-40.0718	-26.7360	-19.5442	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3341	-11.5470	-25.7015	-47.7685	-61.8921	-68.5530	-67.2694	-56.0098	-39.8788	-21.0912	-8.8738	-4.4991	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	889.8444	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	100.0000	
Water heating fuel used	1158.3524	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6160)		
mechanical ventilation fans (SFP = 0.6160)	102.7347	(230a)
Total electricity for the above, kWh/year	102.7347	(231)
Electricity for lighting (calculated in Appendix L)	138.1976	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-986.5999	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1779.9892	(238)

10a. Fuel costs - using BEDF prices (587)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	889.8444	28.4300	252.9828	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1158.3524	28.4300	329.3196	(247)
Energy for instantaneous electric shower(s)	477.4601	28.4300	135.7419	(247a)
Pumps, fans and electric keep-hot	102.7347	28.4300	29.2075	(249)
Energy for lighting	138.1976	28.4300	39.2896	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.1815	28.4300	0.0000	
PV Unit electricity exported	-419.4184	5.8100	0.0000	
Total			0.0000	(252)
Total energy cost			786.5413	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	889.8444	0.1570	139.6644	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1158.3524	0.1408	163.0550	(264)
Energy for instantaneous electric shower(s)	477.4601	0.1391	66.4253	(264a)
Space and water heating			302.7195	(265)
Pumps, fans and electric keep-hot	102.7347	0.1387	14.2506	(267)
Energy for lighting	138.1976	0.1443	19.9462	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.1815	0.1335	-75.6912	
PV Unit electricity exported	-419.4184	0.1230	-51.5734	
Total			-127.2646	(269)
Total CO2, kg/year			276.0769	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	889.8444	1.5811	1406.9113	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1158.3524	1.5205	1761.2621	(278)
Energy for instantaneous electric shower(s)	477.4601	1.5143	723.0342	(278a)
Space and water heating			3168.1733	(279)
Pumps, fans and electric keep-hot	102.7347	1.5128	155.4170	(281)
Energy for lighting	138.1976	1.5338	211.9720	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.1815	1.4931	-846.8839	
PV Unit electricity exported	-419.4184	0.4512	-189.2385	
Total			-1036.1224	(283)
Total Primary energy kWh/year			3222.4741	(286)

SAP 10 EPC IMPROVEMENTS

Plot 1

Current energy efficiency rating: C 72
Current environmental impact rating: A 96

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 72
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 587 TEST (28 Nov 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£787	£787	£0
Space heating	£282	£282	£0
Water heating	£465	£465	£0
Lighting	£39	£39	£0
Total cost of fuels	£787	£787	£0
Total cost of uses	£786	£786	£0
Delivered energy	36 kWh/m²	36 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	65 kWh/m²	65 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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	49.7100	(1b)	x 2.7500	(2b) =	136.7025	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	136.7025	(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												5.0000	(17)
Infiltration rate												0.2500	(18)
Number of sides sheltered												2	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.8500	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.2125	(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	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497	(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) =	83.7000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3524	0.3471	0.3418	0.3152	0.3099	0.2834	0.2834	0.2781	0.2940	0.3099	0.3206	0.3312	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Windows			5.6100	1.1450	6.4237			(27)
Solid door			2.3300	1.2000	2.7960			(26)
Ground floor			49.7100	0.1200	5.9652	75.0000	3728.2500	(28a)
External Wall 1	57.5000	7.9400	49.5600	0.1800	8.9208	70.0000	3469.2000	(29a)
Total net area of external elements Aum(A, m2)			107.2100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.1057			(33)
Main dwelling								
Party Ceiling 1			49.7100			30.0000	1491.3000	(32b)
Timber			33.7400			9.0000	303.6600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 8992.4100	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	180.8974	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	4.0800	0.0500	0.2040
E3 Sill	2.7200	0.0240	0.0653
E4 Jamb	11.7000	0.0190	0.2223
E5 Ground floor (normal)	20.1700	0.0310	0.6253
E7 Party floor between dwellings (in blocks of flats)	30.0200	0.0320	0.9606
E16 Corner (normal)	8.2800	0.0400	0.3312
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0820	-0.2255
P1 Party wall - Ground floor	9.8500	0.3200	3.1520
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.5200	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.3352	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	29.4409	(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	15.8991	15.6594	15.4198	14.2215	13.9818	12.7836	12.7836	12.5439	13.2629	13.9818	14.4612	14.9405	(38)
Heat transfer coeff	45.3400	45.1003	44.8606	43.6624	43.4227	42.2244	42.2244	41.9848	42.7037	43.4227	43.9020	44.3813	(39)
Average = Sum(39)m / 12 =												43.6024	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9121	0.9073	0.9024	0.8783	0.8735	0.8494	0.8494	0.8446	0.8591	0.8735	0.8832	0.8928	(40)
HLP (average)												0.8771	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6816	(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	22.6629	22.3263	21.8523	20.9784	20.3241	19.5985	19.2065	19.6772	20.1896	20.9660	21.8580	22.5863	(42b)
Hot water usage for other uses	31.8509	30.6927	29.5345	28.3763	27.2181	26.0598	26.0598	27.2181	28.3763	29.5345	30.6927	31.8509	(42c)
Average daily hot water use (litres/day)												49.9674	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	54.5138	53.0190	51.3868	49.3547	47.5421	45.6583	45.2664	46.8952	48.5659	50.5005	52.5507	54.4372	(44)
Energy conte	86.3365	75.4984	78.9796	67.5641	64.0008	56.1422	54.7457	58.0661	59.8866	68.5287	74.8680	85.2355	(45)
Energy content (annual)											Total = Sum(45)m =	829.8524	
Distribution loss (46)m = 0.15 x (45)m	12.9505	11.3248	11.8469	10.1346	9.6001	8.4213	8.2119	8.7099	8.9830	10.2793	11.2302	12.7853	(46)

Water storage loss (or HIU loss):		
Store volume	90.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.5000	(48)
Temperature factor from Table 2b	0.6000	(49)
Enter (49) or (54) in (55)	0.9000	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	27.9000	25.2000	27.9000	27.0000	27.9000	27.0000	27.9000	27.9000	27.0000	27.9000	27.0000	27.9000	(56)
If cylinder contains dedicated solar storage	27.9000	25.2000	27.9000	27.0000	27.9000	27.0000	27.9000	27.9000	27.0000	27.9000	27.0000	27.9000	(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	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(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	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(64)
										Total per year (kWh/year) = Sum(64)m =		1158.3524	(64)
Electric shower(s)	41.9747	37.3998	40.8392	38.9723	39.7036	37.8734	39.1359	39.7036	38.9723	40.8392	40.0712	41.9747	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 477.4601 (64a)

Heat gains from water heating, kWh/month

	61.5206	54.6132	58.7905	53.8082	53.5262	49.7356	50.3069	51.5529	51.2554	55.3156	56.5114	61.1545 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	(66)

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

	19.5633	17.3759	14.1311	10.6981	7.9970	6.7514	7.2951	9.4825	12.7273	16.1603	18.8614	20.1070	(67)

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

	218.6280	220.8967	215.1797	203.0089	187.6455	173.2060	163.5596	161.2909	167.0079	179.1787	194.5421	208.9816	(68)

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

	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	(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)

	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	(71)

Water heating gains (Table 5)

	82.6890	81.2696	79.0195	74.7335	71.9438	69.0773	67.6168	69.2915	71.1880	74.3489	78.4881	82.1969	(72)

Total internal gains

	401.2825	399.9445	388.7326	368.8429	347.9885	329.4369	318.8738	320.4671	331.3255	350.0901	372.2939	391.6877	(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	
Northeast	2.5500	11.2829	0.6300	0.7000	0.7700	8.7929	(75)
Southwest	3.0600	36.7938	0.6300	0.7000	0.7700	34.4087	(79)

Solar gains	43.2016	76.5090	112.4408	152.3229	182.4831	186.3841	177.5216	154.2226	126.1264	86.6505	52.2775	36.6274	(83)
Total gains	444.4842	476.4535	501.1734	521.1657	530.4716	515.8211	496.3954	474.6897	457.4519	436.7406	424.5714	428.3152	(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	55.0925	55.3853	55.6811	57.2093	57.5250	59.1575	59.1575	59.4952	58.4935	57.5250	56.8970	56.2825	
alpha	4.6728	4.6924	4.7121	4.8140	4.8350	4.9438	4.9438	4.9663	4.8996	4.8350	4.7931	4.7522	
util living area	0.9640	0.9476	0.9133	0.8336	0.7002	0.5135	0.3725	0.4041	0.6154	0.8422	0.9391	0.9681	(86)
MIT	20.0397	20.1968	20.4355	20.7234	20.9045	20.9840	20.9973	20.9961	20.9611	20.7529	20.3776	20.0286	(87)
Th 2	20.1572	20.1613	20.1654	20.1859	20.1901	20.2107	20.2107	20.2149	20.2024	20.1901	20.1818	20.1736	(88)
util rest of house	0.9568	0.9375	0.8967	0.8040	0.6535	0.4539	0.3065	0.3364	0.5535	0.8083	0.9258	0.9618	(89)
MIT 2	19.0563	19.2545	19.5505	19.9072	20.1068	20.2002	20.2095	20.2130	20.1744	19.9501	19.4975	19.0550	(90)
Living area fraction										fLA = Living area / (4) =		0.5279	(91)
MIT	19.5754	19.7519	20.0177	20.3381	20.5279	20.6140	20.6254	20.6264	20.5897	20.3739	19.9621	19.5689	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5754	19.7519	20.0177	20.3381	20.5279	20.6140	20.6254	20.6264	20.5897	20.3739	19.9621	19.5689	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9509	0.9318	0.8934	0.8099	0.6736	0.4847	0.3413	0.3720	0.5842	0.8165	0.9218	0.9562	(94)
Useful gains	422.6809	443.9670	447.7689	422.0837	357.3188	249.9981	169.4094	176.6020	267.2445	356.6156	391.3516	409.5647	(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	692.5873	669.8259	606.4111	499.4123	383.3313	253.9357	169.9691	177.4427	277.1334	424.4071	564.6716	682.0930	(97)
Space heating kWh	200.8103	151.7771	118.0299	55.6766	19.3533	0.0000	0.0000	0.0000	0.0000	50.4368	124.7904	202.7611	(98a)
Space heating requirement - total per year (kWh/year)												923.6355	
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	200.8103	151.7771	118.0299	55.6766	19.3533	0.0000	0.0000	0.0000	0.0000	50.4368	124.7904	202.7611	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												923.6355	
Space heating per m2											(98c) / (4) =	18.5805	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	200.8103	151.7771	118.0299	55.6766	19.3533	0.0000	0.0000	0.0000	0.0000	50.4368	124.7904	202.7611	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	200.8103	151.7771	118.0299	55.6766	19.3533	0.0000	0.0000	0.0000	0.0000	50.4368	124.7904	202.7611	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Water heating
Water heating requirement

	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355 (64)
Efficiency of water heater												100.0000 (216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (217)
Fuel for water heating, kWh/month												
	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	8.7254	7.8810	8.7254	8.4439	8.7254	8.4439	8.7254	8.7254	8.4439	8.7254	8.4439	8.7254 (231)
Lighting	17.1236	13.7372	12.3688	9.0619	6.9997	5.7188	6.3854	8.2999	10.7808	14.1450	15.9767	17.5996 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-20.3061	-31.0545	-47.9637	-56.9830	-63.7383	-59.8635	-59.2794	-54.3628	-45.8242	-36.2538	-22.9687	-17.2878 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-4.7371	-10.7355	-23.2094	-38.4030	-54.1031	-55.9933	-55.0464	-45.5241	-32.4073	-17.1691	-6.7362	-3.6691 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)

Annual totals kWh/year

Space heating fuel - main system 1	923.6355 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	100.0000
Water heating fuel used	1158.3524 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6160)

mechanical ventilation fans (SFP = 0.6160)	102.7347 (230a)
Total electricity for the above, kWh/year	102.7347 (231)
Electricity for lighting (calculated in Appendix L)	138.1976 (232)

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

PV generation	-863.6197 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1936.7605 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	923.6355	16.4900	152.3075	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1158.3524	16.4900	191.0123	(247)
Energy for instantaneous electric shower(s)	477.4601	16.4900	78.7332	(247a)
Pumps, fans and electric keep-hot	102.7347	16.4900	16.9409	(249)
Energy for lighting	138.1976	16.4900	22.7888	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.8859	16.4900	0.0000	
PV Unit electricity exported	-347.7338	5.5900	0.0000	
Total			0.0000	(252)
Total energy cost			461.7827	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.7553 (257)
SAP value		71.5470
SAP rating (Section 12)		72 (258)
SAP band		C

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	923.6355	0.1563	144.3442	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1158.3524	0.1408	163.0550	(264)
Energy for instantaneous electric shower(s)	477.4601	0.1391	66.4253	(264a)
Space and water heating			307.3992	(265)
Pumps, fans and electric keep-hot	102.7347	0.1387	14.2506	(267)
Energy for lighting	138.1976	0.1443	19.9462	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-515.8859	0.1334	-68.8386	
PV Unit electricity exported	-347.7338	0.1234	-42.9135	
Total			-111.7521	(269)
Total CO2, kg/year			296.2691	(272)
CO2 emissions per m2			5.9600	(273)
EI value			95.8083	
EI rating			96	(274)
EI band			A	

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	49.7100	(1b)	x 2.7500	(2b) =	136.7025	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.7100					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	136.7025	(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	5.0000	(17)
Infiltration rate	0.2500	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.2125	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	6.4000	5.8000	5.5000	4.8000	4.9000	4.5000	4.8000	4.7000	5.0000	5.5000	5.6000	6.0000	(22)
Wind factor	1.6000	1.4500	1.3750	1.2000	1.2250	1.1250	1.2000	1.1750	1.2500	1.3750	1.4000	1.5000	(22a)
Adj infilt rate	0.3400	0.3081	0.2922	0.2550	0.2603	0.2391	0.2550	0.2497	0.2656	0.2922	0.2975	0.3187	(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) =	83.7000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.4215	0.3896	0.3737	0.3365	0.3418	0.3206	0.3365	0.3312	0.3471	0.3737	0.3790	0.4002	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Windows			5.6100	1.1450	6.4237			(27)
Solid door			2.3300	1.2000	2.7960			(26)
Ground floor			49.7100	0.1200	5.9652	75.0000	3728.2500	(28a)
External Wall 1	57.5000	7.9400	49.5600	0.1800	8.9208	70.0000	3469.2000	(29a)
Total net area of external elements Aum(A, m2)			107.2100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.1057			(33)
Main dwelling								
Party Ceiling 1			49.7100			30.0000	1491.3000	(32b)
Timber			33.7400			9.0000	303.6600	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	8992.4100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	180.8974 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	4.0800	0.0500	0.2040
E3 Sill	2.7200	0.0240	0.0653
E4 Jamb	11.7000	0.0190	0.2223
E5 Ground floor (normal)	20.1700	0.0310	0.6253
E7 Party floor between dwellings (in blocks of flats)	30.0200	0.0320	0.9606
E16 Corner (normal)	8.2800	0.0400	0.3312
E17 Corner (inverted - internal area greater than external area)	2.7500	-0.0820	-0.2255
P1 Party wall - Ground floor	9.8500	0.3200	3.1520
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.5200	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.3352 (36)
Point Thermal bridges (36a) =	0.0000
Total fabric heat loss (33) + (36) + (36a) =	29.4409 (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	19.0146	17.5767	16.8577	15.1801	15.4198	14.4612	15.1801	14.9405	15.6594	16.8577	17.0974	18.0560	(38)
Heat transfer coeff	48.4555	47.0175	46.2986	44.6210	44.8606	43.9020	44.6210	44.3813	45.1003	46.2986	46.5382	47.4969	(39)
Average = Sum(39)m / 12 =												45.7993	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9748	0.9458	0.9314	0.8976	0.9024	0.8832	0.8976	0.8928	0.9073	0.9314	0.9362	0.9555	(40)
HLP (average)												0.9213	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6816 (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

22.6629	22.3263	21.8523	20.9784	20.3241	19.5985	19.2065	19.6772	20.1896	20.9660	21.8580	22.5863	(42b)

Hot water usage for other uses

31.8509	30.6927	29.5345	28.3763	27.2181	26.0598	26.0598	27.2181	28.3763	29.5345	30.6927	31.8509	(42c)

Average daily hot water use (litres/day) 49.9674 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	54.5138	53.0190	51.3868	49.3547	47.5421	45.6583	45.2664	46.8952	48.5659	50.5005	52.5507	54.4372	(44)
Energy conte	86.3365	75.4984	78.9796	67.5641	64.0008	56.1422	54.7457	58.0661	59.8866	68.5287	74.8680	85.2355	(45)
Energy content (annual)										Total = Sum(45)m =		829.8524	
Distribution loss (46)m = 0.15 x (45)m													
	12.9505	11.3248	11.8469	10.1346	9.6001	8.4213	8.2119	8.7099	8.9830	10.2793	11.2302	12.7853	(46)
Water storage loss (or HIU loss):													
Store volume												90.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9000	(55)
Total storage loss													
	27.9000	25.2000	27.9000	27.0000	27.9000	27.0000	27.9000	27.9000	27.0000	27.9000	27.0000	27.9000	(56)
If cylinder contains dedicated solar storage													
	27.9000	25.2000	27.9000	27.0000	27.9000	27.0000	27.9000	27.9000	27.0000	27.9000	27.0000	27.9000	(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													
	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(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													
	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(64)
										Total per year (kWh/year) = Sum(64)m =		1158.3524	(64)
Electric shower(s)													
	41.9747	37.3998	40.8392	38.9723	39.7036	37.8734	39.1359	39.7036	38.9723	40.8392	40.0712	41.9747	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		477.4601	(64a)
Heat gains from water heating, kWh/month													
	61.5206	54.6132	58.7905	53.8082	53.5262	49.7356	50.3069	51.5529	51.2554	55.3156	56.5114	61.1545	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	100.8940	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	19.5633	17.3759	14.1311	10.6981	7.9970	6.7514	7.2951	9.4825	12.7273	16.1603	18.8614	20.1070	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	218.6280	220.8967	215.1797	203.0089	187.6455	173.2060	163.5596	161.2909	167.0079	179.1787	194.5421	208.9816	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	46.7710	(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)													
	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	-67.2626	(71)
Water heating gains (Table 5)													
	82.6890	81.2696	79.0195	74.7335	71.9438	69.0773	67.6168	69.2915	71.1880	74.3489	78.4881	82.1969	(72)
Total internal gains													
	401.2825	399.9445	388.7326	368.8429	347.9885	329.4369	318.8738	320.4671	331.3255	350.0901	372.2939	391.6877	(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	
Northeast	2.5500	14.1923	0.6300	0.7000	0.7700	11.0602	(75)
Southwest	3.0600	43.9597	0.6300	0.7000	0.7700	41.1100	(79)

Solar gains	52.1702	79.8936	119.8990	176.9477	201.0033	217.2123	206.5018	179.6424	145.8945	98.2043	61.8608	41.4532	(83)
Total gains	453.4528	479.8381	508.6316	545.7906	548.9918	546.6492	525.3756	500.1095	477.2201	448.2944	434.1547	433.1410	(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	51.5502	53.1268	53.9518	55.9802	55.6811	56.8970	55.9802	56.2825	55.3853	53.9518	53.6740	52.5907	
alpha	4.4367	4.5418	4.5968	4.7320	4.7121	4.7931	4.7320	4.7522	4.6924	4.5968	4.5783	4.5060	
util living area	0.9594	0.9466	0.9068	0.8030	0.6511	0.4593	0.3133	0.3098	0.5329	0.7949	0.9213	0.9618	(86)
MIT	20.0211	20.1637	20.4430	20.7673	20.9300	20.9896	20.9986	20.9988	20.9787	20.8111	20.4451	20.0488	(87)
Th 2	20.1044	20.1287	20.1409	20.1695	20.1654	20.1818	20.1695	20.1736	20.1613	20.1409	20.1368	20.1206	(88)
util rest of house	0.9509	0.9360	0.8886	0.7692	0.5986	0.3971	0.2435	0.2371	0.4617	0.7495	0.9031	0.9537	(89)
MIT 2	18.9943	19.1889	19.5401	19.9411	20.1082	20.1757	20.1691	20.1733	20.1484	19.9710	19.5451	19.0418	(90)
Living area fraction										fLA = Living area / (4) =		0.5279	(91)
MIT	19.5363	19.7035	20.0167	20.3772	20.5420	20.6053	20.6069	20.6090	20.5867	20.4145	20.0202	19.5734	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5363	19.7035	20.0167	20.3772	20.5420	20.6053	20.6069	20.6090	20.5867	20.4145	20.0202	19.5734	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9444	0.9300	0.8857	0.7781	0.6229	0.4296	0.2804	0.2755	0.4983	0.7648	0.9003	0.9476	(94)
Useful gains	428.2632	446.2290	450.4996	424.6808	341.9538	234.8239	147.2985	137.7625	237.8123	342.8721	390.8734	410.4392	(95)
Ext temp.	5.0000	5.2000	6.9000	9.4000	12.5000	15.2000	17.3000	17.5000	15.2000	11.9000	8.3000	5.3000	(96)
Heat loss rate W	704.3638	681.9175	607.2834	489.8150	360.7702	237.3039	147.5593	137.9824	242.9414	394.2074	545.4371	677.9395	(97)
Space heating kWh	205.4189	158.3827	116.6472	46.8967	13.9994	0.0000	0.0000	0.0000	0.0000	38.1935	111.2859	199.0202	(98a)
Space heating requirement - total per year (kWh/year)												889.8444	
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	205.4189	158.3827	116.6472	46.8967	13.9994	0.0000	0.0000	0.0000	0.0000	38.1935	111.2859	199.0202	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												889.8444	
Space heating per m2											(98c) / (4) =	17.9007	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	205.4189	158.3827	116.6472	46.8967	13.9994	0.0000	0.0000	0.0000	0.0000	38.1935	111.2859	199.0202	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	205.4189	158.3827	116.6472	46.8967	13.9994	0.0000	0.0000	0.0000	0.0000	38.1935	111.2859	199.0202	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month	114.2365	100.6984	106.8796	94.5641	91.9008	83.1422	82.6457	85.9661	86.8866	96.4287	101.8680	113.1355	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	8.7254	7.8810	8.7254	8.4439	8.7254	8.4439	8.7254	8.7254	8.4439	8.7254	8.4439	8.7254	(231)
Lighting	17.1236	13.7372	12.3688	9.0619	6.9997	5.7188	6.3854	8.2999	10.7808	14.1450	15.9767	17.5996	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.3148	-32.6006	-50.7236	-63.1404	-67.5561	-65.9577	-65.2721	-60.2410	-51.0233	-40.0718	-26.7360	-19.5442	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.3341	-11.5470	-25.7015	-47.7685	-61.8921	-68.5530	-67.2694	-56.0098	-39.8788	-21.0912	-8.8738	-4.4991	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	889.8444	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	100.0000	
Water heating fuel used	1158.3524	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6160)		
mechanical ventilation fans (SFP = 0.6160)	102.7347	(230a)
Total electricity for the above, kWh/year	102.7347	(231)
Electricity for lighting (calculated in Appendix L)	138.1976	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-986.5999	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1779.9892	(238)

10a. Fuel costs - using BEDF prices (587)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	889.8444	28.4300	252.9828	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1158.3524	28.4300	329.3196	(247)
Energy for instantaneous electric shower(s)	477.4601	28.4300	135.7419	(247a)
Pumps, fans and electric keep-hot	102.7347	28.4300	29.2075	(249)
Energy for lighting	138.1976	28.4300	39.2896	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.1815	28.4300	0.0000	

PV Unit electricity exported	-419.4184	5.8100	0.0000	
Total			0.0000	(252)
Total energy cost			786.5413	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	889.8444	0.1570	139.6644	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1158.3524	0.1408	163.0550	(264)
Energy for instantaneous electric shower(s)	477.4601	0.1391	66.4253	(264a)
Space and water heating			302.7195	(265)
Pumps, fans and electric keep-hot	102.7347	0.1387	14.2506	(267)
Energy for lighting	138.1976	0.1443	19.9462	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.1815	0.1335	-75.6912	
PV Unit electricity exported	-419.4184	0.1230	-51.5734	
Total			-127.2646	(269)
Total CO2, kg/year			276.0769	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	889.8444	1.5811	1406.9113	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1158.3524	1.5205	1761.2621	(278)
Energy for instantaneous electric shower(s)	477.4601	1.5143	723.0342	(278a)
Space and water heating			3168.1733	(279)
Pumps, fans and electric keep-hot	102.7347	1.5128	155.4170	(281)
Energy for lighting	138.1976	1.5338	211.9720	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.1815	1.4931	-846.8839	
PV Unit electricity exported	-419.4184	0.4512	-189.2385	
Total			-1036.1224	(283)
Total Primary energy kWh/year			3222.4741	(286)