

Property Reference	Unit 1		Issued on Date	28/08/2024	
Assessment Reference	Chalgrove Road	Prop Type Ref	Chalgrove Road		
Property					

SAP Rating	86 B	DER	10.89	TER	14.42
Environmental	92 A	% DER < TER		24.48	
CO ₂ Emissions (t/year)	0.6	DFEE	30.78	TFEE	37.97
Compliance Check	See BREL	% DFEE < TFEE		18.93	
% DPER < TPER	17.34	DPER	62.96	TPER	76.17

Assessor Name	Mr. Neil Ingham	Assessor ID	AV35-0001
Client			

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.6000 (1b)	2.5500 (2b)	151.9800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.6000		151.9800 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	151.9800 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	1.0000 (17)
Infiltration rate	0.0500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.0463 (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	0.0590	0.0578	0.0567	0.0509	0.0497	0.0439	0.0439	0.0428	0.0463	0.0497	0.0520	0.0543 (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) =												71.2000 (23c)
Effective ac	0.2030	0.2018	0.2007	0.1949	0.1937	0.1879	0.1879	0.1868	0.1902	0.1937	0.1960	0.1983 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
G (Uw = 1.20)			11.9200	1.1450	13.6489		(27)
GF			59.6000	0.1400	8.3440	110.0000	6556.0000 (28a)
EW	49.5500	11.9200	37.6300	0.1500	5.6445	60.0000	2257.8000 (29a)
SW	7.2700		7.2700	0.1700	1.2359	60.0000	436.2000 (29a)
Total net area of external elements Aum(A, m ²)			116.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.8733		(33)
PW			28.9000	0.0000	0.0000	45.0000	1300.5000 (32)
PC			59.6000			30.0000	1788.0000 (32b)
IW			46.2100			9.0000	415.8900 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12754.3900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							213.9998 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.9600	0.0540	0.3758	

E3 Sill	6.9600	0.0340	0.2366
E4 Jamb	16.5300	0.0390	0.6447
E5 Ground floor (normal)	33.6200	0.0730	2.4543
E6 Intermediate floor within a dwelling	33.6200	-0.0100	-0.3362
E10 Eaves (insulation at ceiling level)	0.0000	0.1230	0.0000
E24 Eaves (insulation at ceiling level - inverted)	0.0000	0.0000	0.0000
E11 Eaves (insulation at rafter level)	0.0000	0.0070	0.0000
E12 Gable (insulation at ceiling level)	0.0000	0.0730	0.0000
E13 Gable (insulation at rafter level)	0.0000	0.0720	0.0000
E14 Flat roof	0.0000	0.0490	0.0000
E16 Corner (normal)	0.0000	0.0420	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0790	-0.0000
E18 Party wall between dwellings	12.7500	0.0250	0.3188
E1 Steel lintel with perforated steel base plate	0.0100	0.0000	0.0000
E21 Exposed floor (inverted)	0.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.0980	0.0000
Joint thermal bridges			3.6940 (36)
Total fabric heat loss		(33) + (36) + (36a) =	0.0000

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	10.1796	10.1216	10.0636	9.7736	9.7157	9.4257	9.4257	9.3677	9.5417	9.7157	9.8316	9.9476 (38)
Average = Sum(39)m / 12 =	42.7468	42.6888	42.6308	42.3409	42.2829	41.9929	41.9929	41.9349	42.1089	42.2829	42.3988	42.5148 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7172	0.7163	0.7153	0.7104	0.7094	0.7046	0.7046	0.7036	0.7065	0.7094	0.7114	0.7133 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.9703 (42)
Hot water usage for mixer showers	57.2551	56.3946	55.1408	52.7419	50.9715	48.9972	47.8750	49.1193	50.4833	52.6031	55.0536	57.0357 (42a)
Hot water usage for baths	24.7448	24.3773	23.8598	22.9056	22.1911	21.3988	20.9709	21.4848	22.0443	22.8921	23.8659	24.6611 (42b)
Hot water usage for other uses	34.8079	33.5421	32.2764	31.0106	29.7449	28.4792	28.4792	29.7449	31.0106	32.2764	33.5421	34.8079 (42c)
Average daily hot water use (litres/day)												107.3731 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	116.8077	114.3140	111.2770	106.6581	102.9075	98.8752	97.3251	100.3490	103.5383	107.7716	112.4616	116.5047 (44)
Energy content (annual)	184.9948	162.7817	171.0285	146.0096	138.5332	121.5786	117.7062	124.2530	127.6731	146.2450	160.2222	182.4182 (45)
Distribution loss (46)m = 0.15 x (45)m	27.7492	24.4172	25.6543	21.9014	20.7800	18.2368	17.6559	18.6380	19.1510	21.9368	24.0333	27.3627 (46)
Water storage loss:												210.0000 (47)
Store volume												1.4100 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7614 (55)
Enter (49) or (54) in (55)												
Total storage loss	23.6034	21.3192	23.6034	22.8420	23.6034	22.8420	23.6034	23.6034	22.8420	23.6034	22.8420	23.6034 (56)
If cylinder contains dedicated solar storage	23.6034	21.3192	23.6034	22.8420	23.6034	22.8420	23.6034	23.6034	22.8420	23.6034	22.8420	23.6034 (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	231.8606	205.1121	217.8943	191.3636	185.3990	166.9326	164.5720	171.1188	173.0271	193.1108	205.5762	229.2840 (62)
WWHRS	-51.0171	-45.1199	-47.2470	-39.1224	-36.4606	-31.1996	-29.2447	-31.0988	-32.2803	-38.0550	-43.1116	-50.0723 (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	180.8436	159.9921	170.6474	152.2412	148.9384	135.7329	135.3273	140.0201	140.7467	155.0559	162.4646	179.2117 (64)
12Total per year (kWh/year)												1861.2219 (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)
Heat gains from water heating, kWh/month	99.0034	87.9892	94.3596	84.8314	83.5549	76.7081	76.6300	78.8068	78.7345	86.1191	89.5571	98.1467 (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	98.5151	98.5151	98.5151	98.5151	98.5151	98.5151	98.5151	98.5151	98.5151	98.5151	98.5151	98.5151 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	88.9879	98.5224	88.9879	91.9542	88.9879	91.9542	88.9879	88.9879	91.9542	88.9879	91.9542	88.9879 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.9370	173.7212	169.2251	159.6536	147.5712	136.2155	128.6292	126.8450	131.3411	140.9126	152.9950	164.3507 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8515	32.8515	32.8515	32.8515	32.8515	32.8515	32.8515	32.8515	32.8515	32.8515	32.8515	32.8515 (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)	-78.8121	-78.8121	-78.8121	-78.8121	-78.8121	-78.8121	-78.8121	-78.8121	-78.8121	-78.8121	-78.8121	-78.8121 (71)
Water heating gains (Table 5)	133.0691	130.9363	126.8275	117.8214	112.3050	106.5390	102.9973	105.9231	109.3535	115.7515	124.3849	131.9176 (72)
Total internal gains	449.5486	458.7344	440.5951	424.9837	404.4187	387.2632	373.1689	374.3106	385.2033	401.2066	424.8886	440.8107 (73)

6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							

Water heating fuel used	2298.9114	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7375)		
mechanical ventilation fans (SFP = 0.7375)	136.7440	(230a)
central heating pump	41.0000	(230c)
Total electricity for the above, kWh/year	177.7440	(231)
Electricity for lighting (calculated in Appendix L)	165.4066	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix O - special features		
Energy used	-0.0000	(236)
Total delivered energy for all uses	0.0000	(237)
	3201.4330	(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	559.3710	0.2100	117.4679 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2298.9114	0.2100	482.7714 (264)
Space and water heating			600.2393 (265)
Pumps, fans and electric keep-hot	177.7440	0.1387	24.6553 (267)
Energy for lighting	165.4066	0.1443	23.8733 (268)
Total CO2, kg/year			648.7679 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.8900 (273)

13a. Primary energy - Individual heating systems including micro-CHP			
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	559.3710	1.1300	632.0892 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2298.9114	1.1300	2597.7698 (278)
Space and water heating			3229.8590 (279)
Pumps, fans and electric keep-hot	177.7440	1.5128	268.8911 (281)
Energy for lighting	165.4066	1.5338	253.7062 (282)
Total Primary energy kWh/year			3752.4564 (286)
Dwelling Primary energy Rate (DPER)			62.9600 (287)

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

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	59.6000 (1b)	x 2.5500 (2b)	= 151.9800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 151.9800 (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) =	0.1316 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3816	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3530	(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	0.4500	0.4412	0.4324	0.3883	0.3794	0.3353	0.3353	0.3265	0.3530	0.3794	0.3971	0.4147 (22b)
Effective ac	0.6013	0.5973	0.5935	0.5754	0.5720	0.5562	0.5562	0.5533	0.5623	0.5720	0.5788	0.5860 (25)

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Southeast	4.7900	36.7938	0.6300	0.7000	0.7700	53.8620 (77)
Southwest	0.8500	36.7938	0.6300	0.7000	0.7700	9.5580 (79)
Northwest	6.2800	11.2829	0.6300	0.7000	0.7700	21.6548 (81)

Solar gains	85.0747	152.1066	227.2244	313.5657	380.4495	390.5554	371.1866	319.3226	256.8149	173.2615	103.2098	71.9587 (83)
Total gains	538.2169	614.2573	671.4130	742.0878	788.4618	781.3571	747.9490	697.2268	645.5566	578.0617	531.6368	516.3630 (84)

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	55.1017	55.2636	55.4233	56.1858	56.3307	57.0157	57.0157	57.1443	56.7499	56.3307	56.0382	55.7356
alpha	4.6734	4.6842	4.6949	4.7457	4.7554	4.8010	4.8010	4.8096	4.7833	4.7554	4.7359	4.7157
util living area	0.9831	0.9681	0.9376	0.8548	0.7085	0.5203	0.3803	0.4240	0.6552	0.8882	0.9671	0.9857 (86)
MIT	19.8294	20.0435	20.3287	20.6753	20.8940	20.9807	20.9965	20.9942	20.9447	20.6613	20.1986	19.7989 (87)
Th 2	20.4354	20.4370	20.4387	20.4463	20.4477	20.4543	20.4543	20.4556	20.4518	20.4477	20.4448	20.4418 (88)
util rest of house	0.9807	0.9637	0.9292	0.8368	0.6775	0.4793	0.3340	0.3753	0.6129	0.8700	0.9619	0.9837 (89)
MIT 2	19.3371	19.5497	19.8303	20.1673	20.3653	20.4419	20.4526	20.4526	20.4133	20.1602	19.7106	19.3119 (90)
Living area fraction	19.7743	19.9883	20.2730	20.6185	20.8348	20.9204	20.9356	20.9336	fLA = Living area / (4) =			0.8881 (91)
MIT	19.7743	19.9883	20.2730	20.6185	20.8348	20.9204	20.9356	20.9336	20.8852	20.6052	20.1440	19.7444 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7743	19.9883	20.2730	20.6185	20.8348	20.9204	20.9356	20.9336	20.8852	20.6052	20.1440	19.7444 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9774	0.9598	0.9265	0.8426	0.6995	0.5144	0.3749	0.4181	0.6466	0.8755	0.9588	0.9807 (94)
Useful gains	526.0358	589.5656	622.0824	625.2853	551.5364	401.9523	280.3699	291.5139	417.4102	506.0793	509.7102	506.4038 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1041.4507	1012.4909	921.5665	773.4571	601.3771	411.0968	282.0007	294.2135	443.3934	658.6785	863.2141	1034.2656 (97)
Space heating kWh	383.4687	284.2058	222.8162	106.6837	37.0815	0.0000	0.0000	0.0000	0.0000	113.5338	254.5228	392.7292 (98a)
Space heating requirement - total per year (kWh/year)												1795.0416
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	383.4687	284.2058	222.8162	106.6837	37.0815	0.0000	0.0000	0.0000	0.0000	113.5338	254.5228	392.7292 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1795.0416
Space heating per m2											(98c) / (4)	= 30.1181 (99)

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)

[illegible][illegible]

(233a)m	-20.3984	-29.7525	-44.2372	-51.5201	-57.1194	-53.9063	-53.2648	-49.5198	-43.1621	-34.8277	-22.7829	-17.5227	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-8.6903	-18.5443	-37.3431	-56.7936	-75.7756	-76.3661	-75.4491	-63.5569	-46.1700	-26.7327	-11.6730	-6.8513	(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												1944.7905	(211)
Space heating fuel - secondary												0.0000	(213)
Efficiency of water heater												0.0000	(215)
Water heating fuel used												79.8000	
Space cooling fuel												2596.5749	(219)
												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)												146.4498	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-981.9598	(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												3791.8555	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP			
	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	1944.7905	0.2100	408.4060 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2596.5749	0.2100	545.2807 (264)
Space and water heating			953.6867 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	146.4498	0.1443	21.1372 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-478.0139	0.1339	-63.9869
PV Unit electricity exported	-503.9459	0.1255	-63.2634
Total			-127.2503 (269)
Total CO2, kg/year			859.5030 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.4200 (273)

13a. Primary energy - Individual heating systems including micro-CHP			
	Energy	Primary energy factor	Primary energy
	kWh/year	kg CO2/kWh	kWh/year
Space heating - main system 1	1944.7905	1.1300	2197.6133 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2596.5749	1.1300	2934.1297 (278)
Space and water heating			5131.7429 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	146.4498	1.5338	224.6296 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-478.0139	1.4947	-714.4789
PV Unit electricity exported	-503.9459	0.4608	-232.2119
Total			-946.6908 (283)
Total Primary energy kWh/year			4539.7826 (286)
Target Primary Energy Rate (TPER)			76.1700 (287)

Property Reference	Unit 4		Issued on Date	28/08/2024	
Assessment Reference	Chalgrove Road	Prop Type Ref	Chalgrove Road		
Property					

SAP Rating	86 B	DER	11.00	TER	12.17
Environmental	91 B	% DER < TER			9.61
CO ₂ Emissions (t/year)	0.85	DFEE	38.29	TFEE	45.12
Compliance Check	See BREL	% DFEE < TFEE			15.13
% DPER < TPER	-0.07	DPER	63.81	TPER	63.76

Client	Mr. Neil Ingham	Assessor ID	AV35-0001
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SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
 CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.4700 (1b)	x 2.6000 (2b)	= 139.0220 (1b) - (3b)
First floor	31.6900 (1c)	x 2.8500 (2c)	= 90.3165 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 229.3385 (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											1.0000 (17)	
Infiltration rate											0.0500 (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) =	0.0425 (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	0.0542	0.0531	0.0521	0.0468	0.0457	0.0404	0.0404	0.0393	0.0425	0.0457	0.0478	0.0499 (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) =											69.6000 (23c)	
Effective ac	0.2062	0.2051	0.2041	0.1987	0.1977	0.1924	0.1924	0.1913	0.1945	0.1977	0.1998	0.2019 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
DOOR			1.7600	1.2000	2.1120		(26)
G (Uw = 1.20)			17.4800	1.1450	20.0153		(27)
GF			53.4700	0.1400	7.4858	110.0000	5881.7000 (28a)
EW	120.8700	19.2400	101.6300	0.1500	15.2445	60.0000	6097.8000 (29a)
FR	54.2400		54.2400	0.1100	5.9664	9.0000	488.1600 (30)
Total net area of external elements Aum(A, m ²)			228.5800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.8240		(33)
PW			34.2300	0.0000	0.0000	45.0000	1540.3500 (32)
IW			147.6900			9.0000	1329.2100 (32c)
Internal Floor 1			31.6900			0.0000	0.0000 (32d)
Internal Ceiling 1			31.6900			0.0000	0.0000 (32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15337.2200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							180.0989 (35)

6. Solar gains

Energy Saving Calculation Example		Heating season)										
Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	57.7791	57.8422	57.9054	58.2236	58.2877	58.6101	58.6101	58.6750	58.4807	58.2877	58.1597	58.0323
alpha	4.8519	4.8561	4.8604	4.8816	4.8858	4.9073	4.9073	4.9117	4.8987	4.8858	4.8773	4.8688
util living area												
	0.9741	0.9499	0.9043	0.7966	0.6351	0.4568	0.3313	0.3705	0.5834	0.8415	0.9506	0.9786 (86)
MIT	20.1972	20.3648	20.5638	20.7756	20.8912	20.9294	20.9356	20.9348	20.9136	20.7570	20.4450	20.1602 (87)
Th 2	20.1966	20.1974	20.1982	20.2023	20.2031	20.2071	20.2071	20.2080	20.2055	20.2031	20.2015	20.1999 (88)
util rest of house												
	0.9689	0.9403	0.8870	0.7648	0.5893	0.4023	0.2721	0.3075	0.5232	0.8079	0.9395	0.9742 (89)
MIT 2	19.2592	19.4684	19.7118	19.9609	20.0830	20.1213	20.1256	20.1261	20.1078	19.9471	19.5744	19.2154 (90)
Living area fraction												
	19.5518	19.7481	19.9776	20.2151	20.3352	20.3735	20.3784	20.3784	20.3592	20.1998	19.8460	19.5102 (91)
MIT												
Temperature adjustment												-0.1500
adjusted MIT	19.4018	19.5981	19.8276	20.0651	20.1852	20.2235	20.2284	20.2284	20.2092	20.0498	19.6960	19.3602 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9624	0.9319	0.8779	0.7589	0.5882	0.4035	0.2737	0.3092	0.5235	0.8007	0.9310	0.9683 (94)
Useful gains	654.1424	731.6355	757.1900	725.5239	597.2186	405.8285	263.4099	277.3683	435.1116	591.9325	626.9600	629.3471 (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	1113.5308	1082.5774	980.5682	816.9737	620.1959	408.7666	263.7437	277.9765	445.0599	690.6984	922.6882	1112.9574 (97)
Space heating kWh	341.7849	235.8329	166.1934	65.8439	17.0951	0.0000	0.0000	0.0000	0.0000	73.4818	212.9243	359.8061 (98a)
Space heating requirement - total per year (kWh/year)												1472.9624
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	341.7849	235.8329	166.1934	65.8439	17.0951	0.0000	0.0000	0.0000	0.0000	73.4818	212.9243	359.8061 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1472.9624
Space heating per m2										(98c) / (4) =		17.2964 (99)

[illegible]

Space heating fuel - main system 1	1595.8422	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	78.9000	
Water heating fuel used	2520.9047	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9625)		
mechanical ventilation fans (SFP = 0.9625)	269.3007	(230a)
central heating pump	41.0000	(230c)
Total electricity for the above, kWh/year	310.3007	(231)
Electricity for lighting (calculated in Appendix L)	203.6039	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Hydro electric generation (Appendix N)	0.0000	(234)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235a)
Appendix Q - special features	0.0000	(235)
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4630.6517	(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	1595.8422	0.2100	335.1269 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2520.9047	0.2100	529.3900 (264)
Space and water heating			864.5169 (265)
Pumps, fans and electric keep-hot	310.3007	0.1387	43.0425 (267)
Energy for lighting	203.6039	0.1443	29.3863 (268)
Total CO2, kg/year			936.9457 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.0000 (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	1595.8422	1.1300	1803.3017 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2520.9047	1.1300	2848.6223 (278)
Space and water heating			4651.9241 (279)
Pumps, fans and electric keep-hot	310.3007	1.5128	469.4229 (281)
Energy for lighting	203.6039	1.5338	312.2945 (282)
Total Primary energy kWh/year			5433.6416 (286)
Dwelling Primary energy Rate (DPER)			63.8100 (287)

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

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	53.4700 (1b)	x 2.6000 (2b)	= 139.0220 (1b) - (3b)
First floor	31.6900 (1c)	x 2.8500 (2c)	= 90.3165 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 229.3385 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1308 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3808 (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) = 0.3237 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)

Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4127	0.4046	0.3965	0.3561	0.3480	0.3075	0.3075	0.2994	0.3237	0.3480	0.3642	0.3803 (22b)
	0.5852	0.5819	0.5786	0.5634	0.5605	0.5473	0.5473	0.5448	0.5524	0.5605	0.5663	0.5723 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.7600	1.0000	1.7600		(26)
TER Opening Type (Uw = 1.20)			17.4800	1.1450	20.0153		(27)
GF			53.4700	0.1300	6.9511		(28a)
EW			101.6300	0.1800	18.2934		(29a)
EW			54.2400	0.1100	5.9664		(30)
Total net area of external elements Aum(A, m2)	120.8700	19.2400	228.5800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.9862		(33)
PW			34.2300	0.0000	0.0000		(32)

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

180.0989 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	14.4500	0.0500	0.7225
E3 Sill	14.4500	0.0500	0.7225
E4 Jamb	31.1800	0.0500	1.5590
E5 Ground floor (normal)	31.7700	0.1600	5.0832
E6 Intermediate floor within a dwelling	25.1800	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	0.0000	0.0600	0.0000
E24 Eaves (insulation at ceiling level - inverted)	0.0000	0.2400	0.0000
E11 Eaves (insulation at rafter level)	0.0000	0.0400	0.0000
E12 Gable (insulation at ceiling level)	0.0000	0.0600	0.0000
E13 Gable (insulation at rafter level)	0.0000	0.0800	0.0000
E14 Flat roof	38.3200	0.0800	3.0656
E16 Corner (normal)	19.5000	0.0900	1.7550
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340
E18 Party wall between dwellings	10.4000	0.0600	0.6240
E1 Steel lintel with perforated steel base plate	0.0100	0.0500	0.0005
E21 Exposed floor (inverted)	0.0000	0.3200	0.0000
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.0700	0.0000

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

13.2983 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 66.2845 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	44.2861	44.0358	43.7905	42.6382	42.4226	41.4191	41.4191	41.2332	41.8056	42.4226	42.8588	43.3147 (38)
Heat transfer coeff	110.5705	110.3203	110.0749	108.9227	108.7071	107.7035	107.7035	107.5177	108.0901	108.7071	109.1432	109.5992 (39)
Average = Sum(39)m / 12 =												108.9217

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2984	1.2954	1.2926	1.2790	1.2765	1.2647	1.2647	1.2625	1.2693	1.2765	1.2816	1.2870 (40)
HLP (average)												1.2790
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5535 (42)
Hot water usage for mixer showers												
67.0338	66.0264	64.5585	61.7498	59.6770	57.3655	56.0517	57.5085	59.1055	61.5874	64.4564	66.7770	(42a)
Hot water usage for baths												
28.9500	28.5200	27.9145	26.7982	25.9623	25.0354	24.5347	25.1360	25.7906	26.7824	27.9217	28.8521	(42b)
Hot water usage for other uses												
40.7806	39.2976	37.8147	36.3318	34.8488	33.3659	33.3659	34.8488	36.3318	37.8147	39.2976	40.7806	(42c)
Average daily hot water use (litres/day)												125.7173 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	136.7643	133.8440	130.2877	124.8797	120.4882	115.7668	113.9523	117.4933	121.2279	126.1844	131.6757	136.4096 (44)
Energy conte	216.6012	190.5921	200.2473	170.9541	162.2002	142.3488	137.8155	145.4813	149.4861	171.2311	187.5962	213.5845 (45)
Energy content (annual)										Total = Sum(45)m =		2088.1386
Distribution loss (46)m = 0.15 x (45)m	32.4902	28.5888	30.0371	25.6431	24.3300	21.3523	20.6723	21.8222	22.4229	25.6847	28.1394	32.0377 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9188 (55)

Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (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												
WWHRS	268.3478	237.3310	251.9939	221.0315	213.9468	192.4262	189.5621	197.2279	199.5634	222.9777	237.6736	265.3311 (62)
PV diverter	-30.6451	-27.1027	-28.3804	-23.5001	-21.9013	-18.7411	-17.5668	-18.6805	-19.3902	-22.8589	-25.8964	-30.0776 (63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	237.7028	210.2283	223.6135	197.5314	192.0456	173.6851	171.9953	178.5474	180.1732	200.1187	211.7771	235.2535 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2412.6719 (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	113.4172	100.7630	107.9795	96.9041	95.3288	87.3929	87.2209	89.7698	89.7660	98.3316	102.4376	112.4141 (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	127.6758	127.6758	127.6758	127.6758	127.6758	127.6758	127.6758	127.6758	127.6758	127.6758	127.6758	127.6758	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.4783	128.9581	116.4783	120.3609	116.4783	120.3609	116.4783	116.4783	120.3609	116.4783	120.3609	116.4783	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	229.8866	232.2721	226.2607	213.4632	197.3086	182.1255	171.9823	169.5968	175.6082	188.4058	204.5604	219.7434	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.7676	35.7676	35.7676	35.7676	35.7676	35.7676	35.7676	35.7676	35.7676	35.7676	35.7676	35.7676	(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)	-102.1406	-102.1406	-102.1406	-102.1406	-102.1406	-102.1406	-102.1406	-102.1406	-102.1406	-102.1406	-102.1406	-102.1406	(71)
Water heating gains (Table 5)	152.4425	149.9449	145.1338	134.5891	128.1302	121.3790	117.2324	120.6583	124.6750	132.1661	142.2745	151.0942	(72)
Total internal gains	563.1101	575.4779	552.1755	532.7159	506.2198	485.1682	466.9958	468.0362	481.9469	501.3529	531.4985	551.6187	(73)

Table 9.3b Calculation Summary

Table 9.3b

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			7.2400		11.2829		0.6300		0.7000		0.7700		24.9651 (75)
Southeast			4.7500		36.7938		0.6300		0.7000		0.7700		53.4122 (77)
Southwest			4.5100		36.7938		0.6300		0.7000		0.7700		50.7135 (79)
Northwest			0.9800		11.2829		0.6300		0.7000		0.7700		3.3792 (81)
Solar gains	132.4700	235.0602	346.6272	471.4042	566.2714	579.0054	551.2195	477.8715	389.4326	266.5343	160.3830	112.2573	(83)
Total gains	695.5801	810.5381	898.8027	1004.1201	1072.4911	1064.1735	1018.2153	945.9077	871.3795	767.8872	691.8815	663.8760	(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	38.5305	38.6179	38.7040	39.1134	39.1910	39.5562	39.5562	39.6245	39.4147	39.1910	39.0344	38.8720		
alpha	3.5687	3.5745	3.5803	3.6076	3.6127	3.6371	3.6371	3.6416	3.6276	3.6127	3.6023	3.5915		
util living area	0.9807	0.9661	0.9398	0.8750	0.7595	0.5935	0.4496	0.4981	0.7193	0.9047	0.9670	0.9835	(86)	
MIT	19.1815	19.4480	19.8249	20.3109	20.6917	20.9091	20.9746	20.9631	20.8128	20.3159	19.6705	19.1392	(87)	
Th 2	19.8421	19.8444	19.8467	19.8573	19.8593	19.8686	19.8686	19.8703	19.8650	19.8593	19.8553	19.8510	(88)	
util rest of house	0.9760	0.9582	0.9253	0.8450	0.7036	0.5065	0.3410	0.3863	0.6385	0.8749	0.9578	0.9795	(89)	
MIT 2	17.7587	18.0957	18.5674	19.1628	19.5927	19.8111	19.8587	19.8547	19.7304	19.1852	18.3878	17.7110	(90)	
Living area fraction									fLA = Living area / (4) =			0.3120	(91)	
MIT	18.2026	18.5176	18.9598	19.5210	19.9356	20.1537	20.2069	20.2005	20.0681	19.5380	18.7880	18.1566	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.2026	18.5176	18.9598	19.5210	19.9356	20.1537	20.2069	20.2005	20.0681	19.5380	18.7880	18.1566	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9668	0.9461	0.9113	0.8347	0.7077	0.5296	0.3743	0.4202	0.6543	0.8647	0.9463	0.9711	(94)	
Ext temp.	672.4874	766.8186	819.0672	838.1348	758.9960	563.5336	381.1676	397.4761	570.1793	663.9871	654.7101	644.7116	(95)	
Heat loss rate W	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)	
Space heating kWh	1537.2176	1502.2999	1371.5075	1156.8710	895.2664	598.1539	388.4732	408.6222	645.0902	971.6200	1275.6647	1529.6351	(97)	
Space heating requirement - total per year (kWh/year)	643.3593	494.2434	411.0156	229.4901	101.3852	0.0000	0.0000	0.0000	0.0000	228.8789	447.0873	658.3831	(98a)	
Solar heating kWh												3213.8428		
Solar heating contribution - total per year (kWh/year)	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)	
Space heating kWh	643.3593	494.2434	411.0156	229.4901	101.3852	0.0000	0.0000	0.0000	0.0000	228.8789	447.0873	658.3831	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												3213.8428		
Space heating per m2										(98c) / (4) =		37.7389	(99)	

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													92.3000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating efficiency (main heating system 1)	643.3593	494.2434	411.0156	229.4901	101.3852	0.0000	0.0000	0.0000	0.0000	228.8789	447.0873	658.3831	(98)	
Space heating fuel (main heating system)	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 efficiency (main heating system 2)	697.0306	535.4750	445.3040	248.6350	109.8431	0.0000	0.0000	0.0000	0.0000	247.9728	484.3849	713.3078	(211)	
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	(212)	
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	(213)	
Water heating requirement	237.7028	210.2283	223.6135	197.5314	192.0456	173.6851	171.9953	178.5474	180.1732	200.1187	211.7771	235.2535	(64)	
Efficiency of water heater	86.1778	85.9086	85.4060	84.3970	82.6959	79.8000	79.8000	79.8000	79.8000	84.3617	85.6935	86.2395	(217)	

Fuel for water heating, kWh/month	275.8283	244.7115	261.8240	234.0503	232.2311	217.6505	215.5330	223.7436	225.7809	237.2152	247.1333	272.7908	(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	24.2019	19.4157	17.4816	12.8078	9.8931	8.0828	9.0248	11.7308	15.2372	19.9920	22.5809	24.8745	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-46.8697	-64.5276	-90.6097	-99.4548	-105.2495	-97.5256	-96.2864	-91.8315	-83.7275	-72.5937	-50.9601	-40.7034	(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	-31.4209	-65.4603	-128.9590	-192.0652	-252.4298	-253.0949	-250.1398	-212.5080	-156.7049	-93.0925	-41.7759	-24.8979	(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												3481.9532	(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												2888.4924	(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)												195.3231	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2642.8887	(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												4008.8800	(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	3481.9532	0.2100	731.2102	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2888.4924	0.2100	606.5834	(264)
Space and water heating			1337.7936	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	195.3231	0.1443	28.1912	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-940.3395	0.1351	-127.0356	
PV Unit electricity exported	-1702.5492	0.1261	-214.7667	
Total			-341.8022	(269)
Total CO2, kg/year			1036.1117	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.1700	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3481.9532	1.1300	3934.6071	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2888.4924	1.1300	3263.9964	(278)
Space and water heating			7198.6035	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	195.3231	1.5338	299.5931	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-940.3395	1.4993	-1409.8679	
PV Unit electricity exported	-1702.5492	0.4630	-788.3606	
Total			-2198.2285	(283)
Total Primary energy kWh/year			5430.0690	(286)
Target Primary Energy Rate (TPER)			63.7600	(287)