Full SAP Calculation Printout

Property Reference	Grosvenor 1BF GND 51 - Lean	**Issued on Date**	13/03/2024
Assessment Reference	Grosvenor 1BF GND 51 Lean	**Prop Type Ref**	1BF GND 51 - Be Lean
Property	Grosvenor Garage, Fitzgerald Avenue, East Sheen, London, SW14 8SZ		

SAP Rating	85 B	**DER**	14.56	**TER**	14.79
Environmental	90 B	**% DER < TER**			1.56
CO_2 Emissions (t/year)	0.65	**DFEE**	28.69	**TFEE**	35.49
Compliance Check	See BREL	**% DFEE < TFEE**			19.17
% DPER < TPER	-3.99	**DPER**	81.40	**TPER**	78.28

Assessor Details	Mr. Ivan Ball	**Assessor ID**	X001-7283
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.0000	(1b)	x 2.5000	(2b) =	127.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	127.5000	(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	1 * 10 =	10.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	10.0000 / (5) =	0.0784	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2284	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1770	(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	0.2257	0.2213	0.2169	0.1947	0.1903	0.1682	0.1682	0.1638	0.1770	0.1903	0.1992	0.2080	(22b)
Effective ac	0.5255	0.5245	0.5235	0.5190	0.5181	0.5141	0.5141	0.5134	0.5157	0.5181	0.5198	0.5216	(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	
Glazed Door/ Window (Uw = 1.20)			10.5400	1.1450	12.0687			(27)
Heatloss Floor 1			51.0000	0.1100	5.6100			(28a)
External Wall 1	47.9300	10.5400	37.3900	0.1500	5.6085			(29a)
Total net area of external elements Aum(A, m2)			98.9300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.2872			(33)
Party Wall			33.4300	0.0000	0.0000			(32)
Party Ceiling			51.0000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.0000	0.0280	0.1680
E3 Sill	3.3000	0.0240	0.0792
E4 Jamb	17.1000	0.0190	0.3249
E16 Corner (normal)	7.5000	0.0370	0.2775
E18 Party wall between dwellings	5.0000	0.0410	0.2050
E5 Ground floor (normal)	19.1700	0.0460	0.8818

Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.9364 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =		25.2236 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.1093	22.0677	22.0269	21.8353	21.7994	21.6326	21.6326	21.6016	21.6968	21.7994	21.8720	21.9478	(38)
Heat transfer coeff	47.3330	47.2913	47.2505	47.0589	47.0231	46.8562	46.8562	46.8253	46.9205	47.0231	47.0956	47.1714	(39)
Average = Sum(39)m / 12 =												47.0588	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9281	0.9273	0.9265	0.9227	0.9220	0.9187	0.9187	0.9181	0.9200	0.9220	0.9234	0.9249	(40)
HLP (average)												0.9227	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7196 (42)

	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	61.1133	60.2056	58.9275	56.5709	54.8063	52.8496	51.7927	53.0619	54.4438	56.5375	58.9427	60.9067	(42b)
Hot water usage for other uses	32.2401	31.0678	29.8954	28.7230	27.5507	26.3783	26.3783	27.5507	28.7230	29.8954	31.0678	32.2401	(42c)
Average daily hot water use (litres/day)												85.9708	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.3534	91.2734	88.8229	85.2939	82.3570	79.2279	78.1710	80.6126	83.1668	86.4329	90.0104	93.1468	(44)
Energy conte	147.8489	129.9721	136.5175	116.7631	110.8683	97.4200	94.5411	99.8152	102.5530	117.2886	128.2364	145.8454	(45)
Energy content (annual)										Total = Sum(45)m =		1427.6696	
Distribution loss (46)m = 0.15 x (45)m	22.1773	19.4958	20.4776	17.5145	16.6302	14.6130	14.1812	14.9723	15.3830	17.5933	19.2355	21.8768	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	47.5719	42.0108	45.2632	42.0628	41.9682	39.0713	39.8351	41.0793	41.0138	44.0453	44.3887	47.4666	(61)
Total heat required for water heating calculated for each month	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(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	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(64)
										Total per year (kWh/year) = Sum(64)m =		1943.4464	(64)
12Total per year (kWh/year)												1943	(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	61.0527	53.7184	56.7079	49.3394	47.3558	42.1600	41.3937	43.4584	44.3523	50.0098	53.7358	60.3602	(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	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	75.8721	84.0012	75.8721	78.4012	75.8721	78.4012	75.8721	75.8721	78.4012	75.8721	78.4012	75.8721	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.8308	151.3856	147.4676	139.1267	128.5978	118.7021	112.0911	110.5364	114.4543	122.7953	133.3242	143.2199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	(71)
Water heating gains (Table 5)	82.0601	79.9381	76.2203	68.5270	63.6502	58.5555	55.6367	58.4118	61.6005	67.2175	74.6330	81.1293	(72)
Total internal gains	359.5566	367.1185	351.3535	337.8484	319.9136	304.4523	292.3934	293.6138	303.2495	317.6784	338.1519	352.0148	(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	6.0800	11.2829	0.5400	0.7000	0.7700	17.9701	(75)
East	4.4600	19.6403	0.5400	0.7000	0.7700	22.9460	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	40.9161	81.4660	139.8261	216.0441	277.6129	290.3588	273.8647	226.2827	166.2795	97.9646	51.2220	33.5450	(83)
Total gains	400.4727	448.5845	491.1796	553.8925	597.5265	594.8111	566.2582	519.8965	469.5290	415.6429	389.3739	385.5598	(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	74.8245	74.8904	74.9550	75.2603	75.3176	75.5859	75.5859	75.6358	75.4823	75.3176	75.2016	75.0808	
alpha	5.9883	5.9927	5.9970	6.0174	6.0212	6.0391	6.0391	6.0424	6.0322	6.0212	6.0134	6.0054	
util living area	0.9915	0.9823	0.9574	0.8691	0.6981	0.5001	0.3636	0.4131	0.6650	0.9172	0.9817	0.9932	(86)
MIT	20.1383	20.2973	20.5292	20.8069	20.9558	20.9947	20.9994	20.9986	20.9747	20.7636	20.4028	20.1024	(87)
Th 2	20.1437	20.1444	20.1450	20.1482	20.1488	20.1516	20.1516	20.1521	20.1505	20.1488	20.1476	20.1464	(88)

util rest of house													
	0.9890	0.9772	0.9452	0.8373	0.6447	0.4357	0.2938	0.3376	0.5928	0.8885	0.9754	0.9911	(89)
MIT 2	19.1490	19.3500	19.6377	19.9638	20.1148	20.1488	20.1514	20.1516	20.1349	19.9245	19.4874	19.1055	(90)
Living area fraction									fLA = Living area / (4) =			0.6118	(91)
MIT	19.7542	19.9295	20.1831	20.4796	20.6293	20.6663	20.6701	20.6698	20.6487	20.4378	20.0474	19.7154	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6042	19.7795	20.0331	20.3296	20.4793	20.5163	20.5201	20.5198	20.4987	20.2878	19.8974	19.5654	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9869	0.9745	0.9434	0.8446	0.6660	0.4636	0.3241	0.3705	0.6232	0.8937	0.9732	0.9893	(94)
Useful gains	395.2416	437.1428	463.3770	467.8198	397.9494	275.7367	183.5446	192.6073	292.6067	371.4734	378.9240	381.4353	(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													
	724.3953	703.6733	639.4441	537.8657	412.8294	277.2159	183.6830	192.9112	300.2287	455.5497	602.7032	724.8059	(97)
Space heating kWh													
	244.8903	179.1085	130.9939	50.4330	11.0708	0.0000	0.0000	0.0000	0.0000	62.5528	161.1210	255.4677	(98a)
Space heating requirement - total per year (kWh/year)												1095.6381	
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													
	244.8903	179.1085	130.9939	50.4330	11.0708	0.0000	0.0000	0.0000	0.0000	62.5528	161.1210	255.4677	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1095.6381	
Space heating per m2											(98c) / (4) =	21.4831	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.5000	(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													
	244.8903	179.1085	130.9939	50.4330	11.0708	0.0000	0.0000	0.0000	0.0000	62.5528	161.1210	255.4677	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	273.6205	200.1212	146.3619	56.3498	12.3696	0.0000	0.0000	0.0000	0.0000	69.8914	180.0235	285.4388	(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													
	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	218.3473	192.1596	203.1069	177.4591	170.7670	152.5042	150.1410	157.4240	160.4098	180.2613	192.8772	215.9910	(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	14.8998	11.9532	10.7625	7.8851	6.0907	4.9761	5.5561	7.2220	9.3807	12.3080	13.9019	15.3139	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1224.1766	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2171.4485	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												120.2500	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3601.8751	(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	1224.1766	0.2100	257.0771	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2171.4485	0.2100	456.0042	(264)
Space and water heating			713.0813	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	120.2500	0.1443	17.3558	(268)
Total CO2, kg/year			742.3663	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.5600	(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	1224.1766	1.1300	1383.3195	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2171.4485	1.1300	2453.7369	(278)
Space and water heating			3837.0564	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	120.2500	1.5338	184.4434	(282)
Total Primary energy kWh/year			4151.6006	(286)
Dwelling Primary energy Rate (DPER)			81.4000	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.0000	(1b)	x 2.5000	(2b) =	127.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		127.5000	(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) =	0.1569	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4069	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3153	(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	0.4020	0.3941	0.3863	0.3469	0.3390	0.2996	0.2996	0.2917	0.3153	0.3390	0.3547	0.3705	(22b)
Effective ac	0.5808	0.5777	0.5746	0.5602	0.5574	0.5449	0.5449	0.5425	0.5497	0.5574	0.5629	0.5686	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			10.5400	1.1450	12.0687			(27)
Heatloss Floor 1			51.0000	0.1300	6.6300			(28a)
External Wall 1	47.9300	10.5400	37.3900	0.1800	6.7302			(29a)
Total net area of external elements Aum(A, m2)			98.9300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.4289			(33)
Party Wall			33.4300	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000	
E3 Sill	3.3000	0.0500	0.1650	
E4 Jamb	17.1000	0.0500	0.8550	
E16 Corner (normal)	7.5000	0.0900	0.6750	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
E5 Ground floor (normal)	19.1700	0.1600	3.0672	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.3622	(36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.7911 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.4378	24.3057	24.1763	23.5684	23.4547	22.9252	22.9252	22.8272	23.1292	23.4547	23.6848	23.9253	(38)
Heat transfer coeff	55.2289	55.0968	54.9674	54.3595	54.2458	53.7163	53.7163	53.6183	53.9203	54.2458	54.4759	54.7164	(39)
Average = Sum(39)m / 12 =												54.3590	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0829	1.0803	1.0778	1.0659	1.0636	1.0533	1.0533	1.0513	1.0573	1.0636	1.0682	1.0729	(40)
HLP (average)												1.0659	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7196 (42)

	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	61.1133	60.2056	58.9275	56.5709	54.8063	52.8496	51.7927	53.0619	54.4438	56.5375	58.9427	60.9067	(42b)
Hot water usage for other uses	32.2401	31.0678	29.8954	28.7230	27.5507	26.3783	26.3783	27.5507	28.7230	29.8954	31.0678	32.2401	(42c)
Average daily hot water use (litres/day)												85.9708	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.3534	91.2734	88.8229	85.2939	82.3570	79.2279	78.1710	80.6126	83.1668	86.4329	90.0104	93.1468	(44)
Energy conte	147.8489	129.9721	136.5175	116.7631	110.8683	97.4200	94.5411	99.8152	102.5530	117.2886	128.2364	145.8454	(45)
Energy content (annual)										Total = Sum(45)m =		1427.6696	
Distribution loss (46)m = 0.15 x (45)m	22.1773	19.4958	20.4776	17.5145	16.6302	14.6130	14.1812	14.9723	15.3830	17.5933	19.2355	21.8768	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	47.5719	42.0108	45.2632	42.0628	41.9682	39.0713	39.8351	41.0793	41.0138	44.0453	44.3887	47.4666	(61)
Total heat required for water heating calculated for each month	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(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	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(64)
										Total per year (kWh/year) = Sum(64)m =		1943.4464	(64)
12Total per year (kWh/year)												1943	(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	61.0527	53.7184	56.7079	49.3394	47.3558	42.1600	41.3937	43.4584	44.3523	50.0098	53.7358	60.3602	(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	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	75.8721	84.0012	75.8721	78.4012	75.8721	78.4012	75.8721	75.8721	78.4012	75.8721	78.4012	75.8721	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.8308	151.3856	147.4676	139.1267	128.5978	118.7021	112.0911	110.5364	114.4543	122.7953	133.3242	143.2199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	(71)
Water heating gains (Table 5)	82.0601	79.9381	76.2203	68.5270	63.6502	58.5555	55.6367	58.4118	61.6005	67.2175	74.6330	81.1293	(72)
Total internal gains	359.5566	367.1185	351.3535	337.8484	319.9136	304.4523	292.3934	293.6138	303.2495	317.6784	338.1519	352.0148	(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	6.0800	11.2829	0.6300	0.7000	0.7700	20.9651	(75)
East	4.4600	19.6403	0.6300	0.7000	0.7700	26.7703	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	47.7355	95.0436	163.1305	252.0515	323.8817	338.7519	319.5088	263.9965	193.9927	114.2920	59.7590	39.1358	(83)
Total gains	407.2921	462.1621	514.4840	589.8999	643.7953	643.2042	611.9023	557.6103	497.2422	431.9704	397.9109	391.1507	(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	64.1271	64.2808	64.4321	65.1526	65.2892	65.9328	65.9328	66.0533	65.6834	65.2892	65.0135	64.7277	
alpha	5.2751	5.2854	5.2955	5.3435	5.3526	5.3955	5.3955	5.4036	5.3789	5.3526	5.3342	5.3152	
util living area	0.9925	0.9845	0.9627	0.8844	0.7252	0.5259	0.3849	0.4393	0.7013	0.9313	0.9844	0.9938	(86)

MIT	19.8975	20.0802	20.3574	20.7096	20.9197	20.9881	20.9982	20.9964	20.9501	20.6543	20.2201	19.8691	(87)
Th 2	20.0148	20.0169	20.0190	20.0288	20.0306	20.0392	20.0392	20.0408	20.0359	20.0306	20.0269	20.0231	(88)
util rest of house	0.9901	0.9797	0.9513	0.8528	0.6667	0.4507	0.3016	0.3493	0.6209	0.9044	0.9787	0.9919	(89)
MIT 2	18.7461	18.9785	19.3257	19.7497	19.9686	20.0329	20.0386	20.0396	20.0048	19.6994	19.1651	18.7160	(90)
Living area fraction										fLA = Living area / (4) =		0.6118	(91)
MIT	19.4505	19.6525	19.9568	20.3369	20.5505	20.6173	20.6256	20.6249	20.5831	20.2836	19.8105	19.4214	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4505	19.6525	19.9568	20.3369	20.5505	20.6173	20.6256	20.6249	20.5831	20.2836	19.8105	19.4214	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9884	0.9775	0.9504	0.8636	0.6991	0.4963	0.3526	0.4044	0.6679	0.9123	0.9772	0.9904	(94)
Useful gains	402.5548	451.7774	488.9856	509.4438	450.0535	319.2528	215.7312	225.4950	332.1270	394.1036	388.8246	387.3836	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	836.7452	812.8144	739.6866	621.7058	480.1004	323.2269	216.2426	226.5330	349.5688	525.2933	692.4170	832.8613	(97)
Space heating kWh	323.0377	242.6169	186.5215	80.8286	22.3549	0.0000	0.0000	0.0000	0.0000	97.6051	218.5865	331.4354	(98a)
Space heating requirement - total per year (kWh/year)												1502.9867	
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	323.0377	242.6169	186.5215	80.8286	22.3549	0.0000	0.0000	0.0000	0.0000	97.6051	218.5865	331.4354	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1502.9867	
Space heating per m2											(98c) / (4) =	29.4703	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	323.0377	242.6169	186.5215	80.8286	22.3549	0.0000	0.0000	0.0000	0.0000	97.6051	218.5865	331.4354	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	349.6079	262.5724	201.8631	87.4769	24.1936	0.0000	0.0000	0.0000	0.0000	105.6333	236.5655	358.6963	(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	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.4505	85.1185	84.4367	83.0083	81.3036	80.3000	80.3000	80.3000	80.3000	83.3389	84.8883	85.5257	(217)
Fuel for water heating, kWh/month	228.6947	202.0511	215.2864	191.3374	187.9824	169.9767	167.3427	175.4601	178.7881	193.5877	203.3554	226.0280	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.7647	12.6470	11.3873	8.3428	6.4442	5.2650	5.8786	7.6413	9.9252	13.0225	14.7088	16.2029	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.5495	-25.6478	-38.2137	-44.6091	-49.5602	-46.8241	-46.2809	-42.9841	-37.3916	-30.0814	-19.6234	-15.0708	(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	-7.3419	-15.6800	-31.5949	-48.0754	-64.1586	-64.6505	-63.8602	-53.7762	-39.0503	-22.5961	-9.8607	-5.7862	(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	1626.6090	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2339.8906	(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)	127.2303	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-840.2676	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3339.4623	(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	1626.6090	0.2100	341.5879	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2339.8906	0.2100	491.3770	(264)
Space and water heating			832.9649	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	127.2303	0.1443	18.3633	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-413.8365	0.1338	-55.3748	
PV Unit electricity exported	-426.4311	0.1255	-53.5287	
Total			-108.9035	(269)
Total CO2, kg/year			754.3540	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.7900	(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	1626.6090	1.1300	1838.0681	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2339.8906	1.1300	2644.0764	(278)
Space and water heating			4482.1446	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	127.2303	1.5338	195.1501	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-413.8365	1.4945	-618.4739	
PV Unit electricity exported	-426.4311	0.4608	-196.4803	
Total			-814.9543	(283)
Total Primary energy kWh/year			3992.4412	(286)
Target Primary Energy Rate (TPER)			78.2800	(287)

Full SAP Calculation Printout

Property Reference	Grosvenor 1BF MID 51 - Lean	**Issued on Date**	13/03/2024
Assessment Reference	Grosvenor 1BF MID 51 Lean	**Prop Type Ref**	1BF MID 51 - Be Lean
Property	Grosvenor Garage, Fitzgerald Avenue, East Sheen, London, SW14 8SZ		

SAP Rating	86 B	**DER**	12.79	**TER**	12.51
Environmental	91 B	**% DER < TER**			-2.24
CO_2 Emissions (t/year)	0.58	**DFEE**	20.82	**TFEE**	25.04
Compliance Check	See BREL	**% DFEE < TFEE**			16.84
% DPER < TPER	-8.91	**DPER**	71.89	**TPER**	66.01

Assessor Details	Mr. Ivan Ball	**Assessor ID**	X001-7283
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.0000	(1b)	x 2.5000	(2b) =	127.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	127.5000	(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	1 * 10 =	10.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	10.0000 / (5) =	0.0784	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2284	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1770	(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	0.2257	0.2213	0.2169	0.1947	0.1903	0.1682	0.1682	0.1638	0.1770	0.1903	0.1992	0.2080	(22b)
Effective ac	0.5255	0.5245	0.5235	0.5190	0.5181	0.5141	0.5141	0.5134	0.5157	0.5181	0.5198	0.5216	(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	
Glazed Door/ Window (Uw = 1.20)			9.7100	1.1450	11.1183			(27)
External Wall 1	47.7500	9.7100	38.0400	0.1500	5.7060			(29a)
Total net area of external elements Aum(A, m2)			47.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.8243			(33)
Party Wall			38.3300	0.0000	0.0000			(32)
Party Floor 1			51.0000					(32d)
Party Ceiling			51.0000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	5.7500	0.0280	0.1610	
E3 Sill	5.7500	0.0240	0.1380	
E4 Jamb	15.3000	0.0190	0.2907	
E16 Corner (normal)	12.5000	0.0370	0.4625	
E18 Party wall between dwellings	5.0000	0.0410	0.2050	
E7 Party floor between dwellings (in blocks of flats)	19.1000	0.0360	0.6876	
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0790	-0.3950	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			1.5498	(36)
Point Thermal bridges		(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.3741 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.1093	22.0677	22.0269	21.8353	21.7994	21.6326	21.6326	21.6016	21.6968	21.7994	21.8720	21.9478	(38)
Heat transfer coeff	40.4835	40.4418	40.4010	40.2094	40.1736	40.0067	40.0067	39.9758	40.0710	40.1736	40.2461	40.3219	(39)
Average = Sum(39)m / 12 =												40.2092	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7938	0.7930	0.7922	0.7884	0.7877	0.7844	0.7844	0.7838	0.7857	0.7877	0.7891	0.7906	(40)
HLP (average)												0.7884	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7196 (42)

Hot water usage for mixer showers

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

61.1133	60.2056	58.9275	56.5709	54.8063	52.8496	51.7927	53.0619	54.4438	56.5375	58.9427	60.9067	(42b)

Hot water usage for other uses

32.2401	31.0678	29.8954	28.7230	27.5507	26.3783	26.3783	27.5507	28.7230	29.8954	31.0678	32.2401	(42c)

Average daily hot water use (litres/day) 85.9708 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.3534	91.2734	88.8229	85.2939	82.3570	79.2279	78.1710	80.6126	83.1668	86.4329	90.0104	93.1468	(44)
Energy conte	147.8489	129.9721	136.5175	116.7631	110.8683	97.4200	94.5411	99.8152	102.5530	117.2886	128.2364	145.8454	(45)
Energy content (annual)										Total = Sum(45)m =		1427.6696	
Distribution loss (46)m = 0.15 x (45)m	22.1773	19.4958	20.4776	17.5145	16.6302	14.6130	14.1812	14.9723	15.3830	17.5933	19.2355	21.8768	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	47.5719	42.0108	45.2632	42.0628	41.9682	39.0713	39.8351	41.0793	41.0138	44.0453	44.3887	47.4666	(61)
Total heat required for water heating calculated for each month	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(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	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(64)
									Total per year (kWh/year) = Sum(64)m =			1943.4464	(64)
12Total per year (kWh/year)												1943	(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	61.0527	53.7184	56.7079	49.3394	47.3558	42.1600	41.3937	43.4584	44.3523	50.0098	53.7358	60.3602	(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	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.5526	84.7546	76.5526	79.1043	76.5526	79.1043	76.5526	76.5526	79.1043	76.5526	79.1043	76.5526	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.8308	151.3856	147.4676	139.1267	128.5978	118.7021	112.0911	110.5364	114.4543	122.7953	133.3242	143.2199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	(71)
Water heating gains (Table 5)	82.0601	79.9381	76.2203	68.5270	63.6502	58.5555	55.6367	58.4118	61.6005	67.2175	74.6330	81.1293	(72)
Total internal gains	360.2370	367.8719	352.0340	338.5515	320.5941	305.1554	293.0739	294.2943	303.9527	318.3588	338.8550	352.6953	(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	6.0600	11.2829	0.5400	0.7000	0.7700	17.9110	(75)
East	1.2200	19.6403	0.5400	0.7000	0.7700	6.2767	(76)
Southeast	2.4300	36.7938	0.5400	0.7000	0.7700	23.4210	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	47.6088	88.6317	140.4931	205.0015	256.9051	266.7988	252.3505	211.9974	162.6626	103.2167	58.4160	39.8322	(83)
Total gains	407.8458	456.5035	492.5271	543.5530	577.4992	571.9542	545.4245	506.2917	466.6152	421.5756	397.2711	392.5275	(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	87.4843	87.5743	87.6628	88.0805	88.1591	88.5269	88.5269	88.5953	88.3849	88.1591	88.0003	87.8348	
alpha	6.8323	6.8383	6.8442	6.8720	6.8773	6.9018	6.9018	6.9064	6.8923	6.8773	6.8667	6.8557	
util living area	0.9872	0.9719	0.9347	0.8198	0.6351	0.4467	0.3226	0.3630	0.5859	0.8691	0.9704	0.9899	(86)

MIT	20.3854	20.5337	20.7179	20.9079	20.9846	20.9988	20.9999	20.9998	20.9930	20.8843	20.6087	20.3503	(87)
Th 2	20.2587	20.2594	20.2601	20.2634	20.2640	20.2668	20.2668	20.2674	20.2657	20.2640	20.2628	20.2615	(88)
util rest of house	0.9836	0.9646	0.9188	0.7861	0.5888	0.3960	0.2689	0.3053	0.5264	0.8344	0.9613	0.9870	(89)
MIT 2	19.5524	19.7378	19.9618	20.1778	20.2524	20.2662	20.2668	20.2673	20.2615	20.1586	19.8359	19.5105	(90)
Living area fraction										fLA = Living area / (4) =		0.6118	(91)
MIT	20.0620	20.2247	20.4244	20.6244	20.7004	20.7143	20.7153	20.7154	20.7090	20.6026	20.3087	20.0243	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.9120	20.0747	20.2744	20.4744	20.5504	20.5643	20.5653	20.5654	20.5590	20.4526	20.1587	19.8743	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9816	0.9624	0.9191	0.7962	0.6071	0.4166	0.2908	0.3288	0.5504	0.8439	0.9598	0.9852	(94)
Useful gains	400.3490	439.3596	452.6992	432.7538	350.5787	238.2798	158.6152	166.4627	256.8160	355.7664	381.3113	386.7106	(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	632.0266	613.6915	556.4982	465.4012	355.5507	238.6134	158.6376	166.5144	258.8189	395.8124	525.5614	632.0176	(97)
Space heating kWh	172.3681	117.1510	77.2265	23.5061	3.6991	0.0000	0.0000	0.0000	0.0000	29.7942	103.8601	182.5084	(98a)
Space heating requirement - total per year (kWh/year)												710.1136	
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	172.3681	117.1510	77.2265	23.5061	3.6991	0.0000	0.0000	0.0000	0.0000	29.7942	103.8601	182.5084	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												710.1136	
Space heating per m2											(98c) / (4) =	13.9238	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												89.5000	(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	172.3681	117.1510	77.2265	23.5061	3.6991	0.0000	0.0000	0.0000	0.0000	29.7942	103.8601	182.5084	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	192.5901	130.8950	86.2866	26.2638	4.1331	0.0000	0.0000	0.0000	0.0000	33.2896	116.0448	203.9200	(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	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	218.3473	192.1596	203.1069	177.4591	170.7670	152.5042	150.1410	157.4240	160.4098	180.2613	192.8772	215.9910	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.0334	12.0604	10.8590	7.9558	6.1453	5.0208	5.6059	7.2868	9.4648	12.4184	14.0265	15.4513	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	793.4230	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2171.4485	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	121.3285	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3172.2000	(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	793.4230	0.2100	166.6188	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2171.4485	0.2100	456.0042	(264)
Space and water heating			622.6230	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	121.3285	0.1443	17.5114	(268)
Total CO2, kg/year			652.0637	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.7900	(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	793.4230	1.1300	896.5680	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2171.4485	1.1300	2453.7369	(278)
Space and water heating			3350.3048	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	121.3285	1.5338	186.0976	(282)
Total Primary energy kWh/year			3666.5033	(286)
Dwelling Primary energy Rate (DPER)			71.8900	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.0000	(1b) x	2.5000	(2b) =	127.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	127.5000	(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) =	0.1569	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4069	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3153	(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	0.4020	0.3941	0.3863	0.3469	0.3390	0.2996	0.2996	0.2917	0.3153	0.3390	0.3547	0.3705	(22b)
Effective ac	0.5808	0.5777	0.5746	0.5602	0.5574	0.5449	0.5449	0.5425	0.5497	0.5574	0.5629	0.5686	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			9.7100	1.1450	11.1183			(27)
External Wall 1	47.7500	9.7100	38.0400	0.1800	6.8472			(29a)
Total net area of external elements Aum(A, m2)			47.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.9655			(33)
Party Wall			38.3300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

		Length	Psi-value	Total
K1	Element			
E2	Other lintels (including other steel lintels)	5.7500	0.0500	0.2875
E3	Sill	5.7500	0.0500	0.2875
E4	Jamb	15.3000	0.0500	0.7650
E16	Corner (normal)	12.5000	0.0900	1.1250
E18	Party wall between dwellings	5.0000	0.0600	0.3000
E7	Party floor between dwellings (in blocks of flats)	19.1000	0.0700	1.3370

E17 Corner (inverted - internal area greater than external area) 5.0000 -0.0900 -0.4500
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.6520 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 21.6175 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.4378	24.3057	24.1763	23.5684	23.4547	22.9252	22.9252	22.8272	23.1292	23.4547	23.6848	23.9253	(38)
Heat transfer coeff	46.0553	45.9233	45.7938	45.1859	45.0722	44.5428	44.5428	44.4447	44.7467	45.0722	45.3023	45.5428	(39)
Average = Sum(39)m / 12 =												45.1854	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9030	0.9005	0.8979	0.8860	0.8838	0.8734	0.8734	0.8715	0.8774	0.8838	0.8883	0.8930	(40)
HLP (average)												0.8860	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7196 (42)
Hot water usage for mixer showers

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

61.1133	60.2056	58.9275	56.5709	54.8063	52.8496	51.7927	53.0619	54.4438	56.5375	58.9427	60.9067	(42b)

Hot water usage for other uses

32.2401	31.0678	29.8954	28.7230	27.5507	26.3783	26.3783	27.5507	28.7230	29.8954	31.0678	32.2401	(42c)

Average daily hot water use (litres/day) 85.9708 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.3534	91.2734	88.8229	85.2939	82.3570	79.2279	78.1710	80.6126	83.1668	86.4329	90.0104	93.1468	(44)
Energy conte	147.8489	129.9721	136.5175	116.7631	110.8683	97.4200	94.5411	99.8152	102.5530	117.2886	128.2364	145.8454	(45)
Energy content (annual)										Total = Sum(45)m =		1427.6696	
Distribution loss (46)m = 0.15 x (45)m	22.1773	19.4958	20.4776	17.5145	16.6302	14.6130	14.1812	14.9723	15.3830	17.5933	19.2355	21.8768	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	47.5719	42.0108	45.2632	42.0628	41.9682	39.0713	39.8351	41.0793	41.0138	44.0453	44.3887	47.4666	(61)
Total heat required for water heating calculated for each month	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(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	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(64)
										Total per year (kWh/year) = Sum(64)m =		1943.4464	(64)
12Total per year (kWh/year)												1943	(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	61.0527	53.7184	56.7079	49.3394	47.3558	42.1600	41.3937	43.4584	44.3523	50.0098	53.7358	60.3602	(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	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.5526	84.7546	76.5526	79.1043	76.5526	79.1043	76.5526	76.5526	79.1043	76.5526	79.1043	76.5526	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.8308	151.3856	147.4676	139.1267	128.5978	118.7021	112.0911	110.5364	114.4543	122.7953	133.3242	143.2199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	(71)
Water heating gains (Table 5)	82.0601	79.9381	76.2203	68.5270	63.6502	58.5555	55.6367	58.4118	61.6005	67.2175	74.6330	81.1293	(72)
Total internal gains	360.2370	367.8719	352.0340	338.5515	320.5941	305.1554	293.0739	294.2943	303.9527	318.3588	338.8550	352.6953	(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	6.0600	11.2829	0.6300	0.7000	0.7700	20.8962	(75)
East	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(76)
Southeast	2.4300	36.7938	0.6300	0.7000	0.7700	27.3246	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	55.5436	103.4036	163.9087	239.1684	299.7226	311.2653	294.4090	247.3303	189.7730	120.4195	68.1520	46.4709	(83)
Total gains	415.7806	471.2755	515.9426	577.7199	620.3167	616.4207	587.4829	541.6246	493.7257	438.7784	407.0071	399.1663	(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	76.9003	77.1214	77.3394	78.3798	78.5776	79.5116	79.5116	79.6870	79.1492	78.5776	78.1785	77.7656
alpha	6.1267	6.1414	6.1560	6.2253	6.2385	6.3008	6.3008	6.3125	6.2766	6.2385	6.2119	6.1844

util living area													
	0.9893	0.9762	0.9435	0.8368	0.6556	0.4605	0.3334	0.3770	0.6126	0.8886	0.9754	0.9914	(86)
MIT	20.2125	20.3850	20.6096	20.8602	20.9723	20.9974	20.9997	20.9994	20.9861	20.8258	20.4864	20.1854	(87)
Th 2	20.1649	20.1671	20.1693	20.1794	20.1813	20.1902	20.1902	20.1918	20.1868	20.1813	20.1775	20.1735	(88)
util rest of house													
	0.9861	0.9696	0.9286	0.8023	0.6044	0.4032	0.2722	0.3110	0.5457	0.8549	0.9674	0.9888	(89)
MIT 2	19.2593	19.4773	19.7541	20.0485	20.1604	20.1888	20.1901	20.1916	20.1784	20.0205	19.6148	19.2319	(90)
Living area fraction									fLA = Living area / (4) =			0.6118	(91)
MIT	19.8424	20.0326	20.2775	20.5451	20.6571	20.6834	20.6854	20.6858	20.6725	20.5132	20.1480	19.8152	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8424	20.0326	20.2775	20.5451	20.6571	20.6834	20.6854	20.6858	20.6725	20.5132	20.1480	19.8152	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9847	0.9684	0.9308	0.8183	0.6345	0.4382	0.3096	0.3514	0.5861	0.8695	0.9671	0.9875	(94)
Useful gains	409.3998	456.3804	480.2281	472.7433	393.5955	270.1153	181.8965	190.3120	289.3867	381.5354	393.6177	394.1646	(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													
	715.8121	694.9374	630.9242	526.1928	403.7171	270.9732	181.9745	190.4806	294.0983	446.8085	591.1050	711.1612	(97)
Space heating kWh													
	227.9707	160.3103	112.1179	38.4836	7.5304	0.0000	0.0000	0.0000	0.0000	48.5632	142.1908	235.8454	(98a)
Space heating requirement - total per year (kWh/year)												973.0124	
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													
	227.9707	160.3103	112.1179	38.4836	7.5304	0.0000	0.0000	0.0000	0.0000	48.5632	142.1908	235.8454	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												973.0124	
Space heating per m2											(98c) / (4) =	19.0787	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	227.9707	160.3103	112.1179	38.4836	7.5304	0.0000	0.0000	0.0000	0.0000	48.5632	142.1908	235.8454	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	246.7215	173.4960	121.3397	41.6490	8.1498	0.0000	0.0000	0.0000	0.0000	52.5576	153.8862	255.2440	(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													
	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(64)
Efficiency of water heater												80.3000	(216)
(217)m	84.7125	84.2311	83.3769	81.8442	80.6664	80.3000	80.3000	80.3000	80.3000	82.1384	83.9688	84.8087	(217)
Fuel for water heating, kWh/month													
	230.6872	204.1799	218.0227	194.0587	189.4673	169.9767	167.3427	175.4601	178.7881	196.4171	205.5823	227.9389	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.9061	12.7605	11.4894	8.4176	6.5020	5.3122	5.9314	7.7098	10.0143	13.1393	14.8408	16.3482	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.5516	-25.6516	-38.2198	-44.6161	-49.5673	-46.8304	-46.2880	-42.9921	-37.3994	-30.0872	-19.6264	-15.0726	(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	-7.3397	-15.6762	-31.5889	-48.0684	-64.1516	-64.6442	-63.8531	-53.7682	-39.0425	-22.5903	-9.8577	-5.7844	(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	1053.0437	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2357.9217	(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)	128.3714	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-840.2676	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2785.0692	(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	1053.0437	0.2100	221.1392	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2357.9217	0.2100	495.1636	(264)
Space and water heating			716.3027	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.3714	0.1443	18.5280	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-413.9023	0.1338	-55.3835	
PV Unit electricity exported	-426.3653	0.1255	-53.5200	
Total			-108.9035	(269)
Total CO2, kg/year			637.8565	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.5100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1053.0437	1.1300	1189.9394	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2357.9217	1.1300	2664.4515	(278)
Space and water heating			3854.3909	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.3714	1.5338	196.9004	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-413.9023	1.4945	-618.5720	
PV Unit electricity exported	-426.3653	0.4608	-196.4481	
Total			-815.0202	(283)
Total Primary energy kWh/year			3366.3719	(286)
Target Primary Energy Rate (TPER)			66.0100	(287)

Full SAP Calculation Printout

Property Reference	Grosvenor 1BF TOP 51 - Lean	**Issued on Date**	13/03/2024
Assessment Reference	Grosvenor 1BF TOP 51 Lean	**Prop Type Ref**	1BF TOP 51 - Be Lean
Property	Grosvenor Garage, Fitzgerald Avenue, East Sheen, London, SW14 8SZ		

SAP Rating	85 B	**DER**	14.50	**TER**	14.22
Environmental	90 B	**% DER < TER**			-1.97
CO_2 Emissions (t/year)	0.65	**DFEE**	28.21	**TFEE**	32.68
Compliance Check	See BREL	**% DFEE < TFEE**			13.67
% DPER < TPER	-7.84	**DPER**	81.13	**TPER**	75.23

Assessor Details	Mr. Ivan Ball	**Assessor ID**	X001-7283
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.0000	(1b)	x 2.5000	(2b) =	127.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		127.5000	(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	1 * 10 =	10.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	10.0000 / (5) =	0.0784	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2284	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1770	(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	0.2257	0.2213	0.2169	0.1947	0.1903	0.1682	0.1682	0.1638	0.1770	0.1903	0.1992	0.2080	(22b)
Effective ac	0.5255	0.5245	0.5235	0.5190	0.5181	0.5141	0.5141	0.5134	0.5157	0.5181	0.5198	0.5216	(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	
Glazed Door/ Window (Uw = 1.20)			9.7100	1.1450	11.1183			(27)
External Wall 1	47.7500	9.7100	38.0400	0.1500	5.7060			(29a)
Flat Roof	51.0000		51.0000	0.1200	6.1200			(30)
Total net area of external elements Aum(A, m2)			98.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.9443			(33)
Party Wall			38.3300	0.0000	0.0000			(32)
Party Floor 1			51.0000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.7500	0.0280	0.1610
E3 Sill	5.7500	0.0240	0.1380
E4 Jamb	15.3000	0.0190	0.2907
E16 Corner (normal)	12.5000	0.0370	0.4625
E18 Party wall between dwellings	5.0000	0.0410	0.2050
E7 Party floor between dwellings (in blocks of flats)	19.1000	0.0360	0.6876
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0790	-0.3950
E14 Flat roof	19.1000	0.0410	0.7831
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			2.3329 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.2772 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.1093	22.0677	22.0269	21.8353	21.7994	21.6326	21.6326	21.6016	21.6968	21.7994	21.8720	21.9478	(38)
Heat transfer coeff	47.3866	47.3449	47.3041	47.1125	47.0767	46.9098	46.9098	46.8789	46.9741	47.0767	47.1492	47.2250	(39)
Average = Sum(39)m / 12 =												47.1123	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9291	0.9283	0.9275	0.9238	0.9231	0.9198	0.9198	0.9192	0.9211	0.9231	0.9245	0.9260	(40)
HLP (average)												0.9238	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7196 (42)
Hot water usage for mixer showers

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

61.1133	60.2056	58.9275	56.5709	54.8063	52.8496	51.7927	53.0619	54.4438	56.5375	58.9427	60.9067	(42b)

Hot water usage for other uses

32.2401	31.0678	29.8954	28.7230	27.5507	26.3783	26.3783	27.5507	28.7230	29.8954	31.0678	32.2401	(42c)

Average daily hot water use (litres/day) 85.9708 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.3534	91.2734	88.8229	85.2939	82.3570	79.2279	78.1710	80.6126	83.1668	86.4329	90.0104	93.1468	(44)
Energy conte	147.8489	129.9721	136.5175	116.7631	110.8683	97.4200	94.5411	99.8152	102.5530	117.2886	128.2364	145.8454	(45)
Energy content (annual)										Total = Sum(45)m =		1427.6696	
Distribution loss (46)m = 0.15 x (45)m	22.1773	19.4958	20.4776	17.5145	16.6302	14.6130	14.1812	14.9723	15.3830	17.5933	19.2355	21.8768	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	47.5719	42.0108	45.2632	42.0628	41.9682	39.0713	39.8351	41.0793	41.0138	44.0453	44.3887	47.4666	(61)
Total heat required for water heating calculated for each month	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(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	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(64)
										Total per year (kWh/year) = Sum(64)m =		1943.4464	(64)
12Total per year (kWh/year)												1943	(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	61.0527	53.7184	56.7079	49.3394	47.3558	42.1600	41.3937	43.4584	44.3523	50.0098	53.7358	60.3602	(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	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.5526	84.7546	76.5526	79.1043	76.5526	79.1043	76.5526	76.5526	79.1043	76.5526	79.1043	76.5526	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.8308	151.3856	147.4676	139.1267	128.5978	118.7021	112.0911	110.5364	114.4543	122.7953	133.3242	143.2199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	(71)
Water heating gains (Table 5)	82.0601	79.9381	76.2203	68.5270	63.6502	58.5555	55.6367	58.4118	61.6005	67.2175	74.6330	81.1293	(72)
Total internal gains	360.2370	367.8719	352.0340	338.5515	320.5941	305.1554	293.0739	294.2943	303.9527	318.3588	338.8550	352.6953	(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	6.0600	11.2829	0.5400	0.7000	0.7700	17.9110	(75)
East	1.2200	19.6403	0.5400	0.7000	0.7700	6.2767	(76)
Southeast	2.4300	36.7938	0.5400	0.7000	0.7700	23.4210	(77)

Solar gains	47.6088	88.6317	140.4931	205.0015	256.9051	266.7988	252.3505	211.9974	162.6626	103.2167	58.4160	39.8322	(83)
Total gains	407.8458	456.5035	492.5271	543.5530	577.4992	571.9542	545.4245	506.2917	466.6152	421.5756	397.2711	392.5275	(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	74.7399	74.8056	74.8701	75.1746	75.2319	75.4995	75.4995	75.5493	75.3962	75.2319	75.1162	74.9956	
alpha	5.9827	5.9870	5.9913	6.0116	6.0155	6.0333	6.0333	6.0366	6.0264	6.0155	6.0077	5.9997	
util living area	0.9907	0.9808	0.9570	0.8770	0.7177	0.5197	0.3778	0.4245	0.6690	0.9131	0.9799	0.9925	(86)

MIT	20.1518	20.3111	20.5300	20.7953	20.9488	20.9935	20.9992	20.9984	20.9738	20.7705	20.4168	20.1152	(87)
Th 2	20.1428	20.1435	20.1442	20.1473	20.1479	20.1507	20.1507	20.1512	20.1496	20.1479	20.1467	20.1455	(88)
util rest of house	0.9880	0.9753	0.9448	0.8462	0.6641	0.4531	0.3052	0.3470	0.5966	0.8834	0.9731	0.9903	(89)
MIT 2	19.1654	19.3664	19.6379	19.9507	20.1081	20.1472	20.1504	20.1507	20.1334	19.9311	19.5039	19.1211	(90)
Living area fraction										fLA = Living area / (4) =		0.6118	(91)
MIT	19.7689	19.9444	20.1836	20.4674	20.6224	20.6650	20.6697	20.6693	20.6475	20.4446	20.0624	19.7292	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6189	19.7944	20.0336	20.3174	20.4724	20.5150	20.5197	20.5193	20.4975	20.2946	19.9124	19.5792	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9858	0.9726	0.9429	0.8529	0.6852	0.4819	0.3368	0.3807	0.6271	0.8891	0.9708	0.9884	(94)
Useful gains	402.0652	443.9885	464.4240	463.5747	395.6763	275.6403	183.6989	192.7525	292.6135	374.8356	385.6905	387.9699	(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	725.9085	705.1734	640.1966	537.9009	412.9744	277.4695	183.8715	193.1079	300.5183	456.3910	604.0932	726.2849	(97)
Space heating kWh	240.9395	175.5163	130.7749	53.5149	12.8698	0.0000	0.0000	0.0000	0.0000	60.6772	157.2499	251.7064	(98a)
Space heating requirement - total per year (kWh/year)												1083.2489	
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	240.9395	175.5163	130.7749	53.5149	12.8698	0.0000	0.0000	0.0000	0.0000	60.6772	157.2499	251.7064	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1083.2489	
Space heating per m2											(98c) / (4) =	21.2402	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	89.5000 (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	240.9395	175.5163	130.7749	53.5149	12.8698	0.0000	0.0000	0.0000	0.0000	60.6772	157.2499	251.7064	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	269.2061	196.1076	146.1172	59.7932	14.3797	0.0000	0.0000	0.0000	0.0000	67.7958	175.6983	281.2362	(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	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	218.3473	192.1596	203.1069	177.4591	170.7670	152.5042	150.1410	157.4240	160.4098	180.2613	192.8772	215.9910	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.0334	12.0604	10.8590	7.9558	6.1453	5.0208	5.6059	7.2868	9.4648	12.4184	14.0265	15.4513	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1210.3339 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	89.5000
Water heating fuel used	2171.4485 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	121.3285 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3589.1109 (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	1210.3339	0.2100	254.1701	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2171.4485	0.2100	456.0042	(264)
Space and water heating			710.1743	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	121.3285	0.1443	17.5114	(268)
Total CO2, kg/year			739.6150	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.5000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1210.3339	1.1300	1367.6774	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2171.4485	1.1300	2453.7369	(278)
Space and water heating			3821.4142	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	121.3285	1.5338	186.0976	(282)
Total Primary energy kWh/year			4137.6126	(286)
Dwelling Primary energy Rate (DPER)			81.1300	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.0000	(1b)	x 2.5000	(2b) =	127.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		127.5000	(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) =	0.1569 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4069 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3153 (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	0.4020	0.3941	0.3863	0.3469	0.3390	0.2996	0.2996	0.2917	0.3153	0.3390	0.3547	0.3705	(22b)
Effective ac	0.5808	0.5777	0.5746	0.5602	0.5574	0.5449	0.5449	0.5425	0.5497	0.5574	0.5629	0.5686	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			9.7100	1.1450	11.1183			(27)
External Wall 1	47.7500	9.7100	38.0400	0.1800	6.8472			(29a)
Flat Roof	51.0000		51.0000	0.1100	5.6100			(30)
Total net area of external elements Aum(A, m2)			98.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.5755			(33)
Party Wall			38.3300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.7500	0.0500	0.2875
E3 Sill	5.7500	0.0500	0.2875
E4 Jamb	15.3000	0.0500	0.7650
E16 Corner (normal)	12.5000	0.0900	1.1250

E18 Party wall between dwellings	5.0000	0.0600	0.3000	
E7 Party floor between dwellings (in blocks of flats)	19.1000	0.0700	1.3370	
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0900	-0.4500	
E14 Flat roof	19.1000	0.0800	1.5280	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.1800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.7555 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.4378	24.3057	24.1763	23.5684	23.4547	22.9252	22.9252	22.8272	23.1292	23.4547	23.6848	23.9253	(38)
Heat transfer coeff	53.1933	53.0613	52.9318	52.3239	52.2102	51.6808	51.6808	51.5827	51.8847	52.2102	52.4403	52.6808	(39)

Average = Sum(39)m / 12 = 52.3234

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0430	1.0404	1.0379	1.0260	1.0237	1.0133	1.0133	1.0114	1.0173	1.0237	1.0282	1.0330	(40)
HLP (average)												1.0259	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7196 (42)

Hot water usage for mixer showers

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

61.1133	60.2056	58.9275	56.5709	54.8063	52.8496	51.7927	53.0619	54.4438	56.5375	58.9427	60.9067	(42b)

Hot water usage for other uses

32.2401	31.0678	29.8954	28.7230	27.5507	26.3783	26.3783	27.5507	28.7230	29.8954	31.0678	32.2401	(42c)

Average daily hot water use (litres/day) 85.9708 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.3534	91.2734	88.8229	85.2939	82.3570	79.2279	78.1710	80.6126	83.1668	86.4329	90.0104	93.1468	(44)
Energy conte	147.8489	129.9721	136.5175	116.7631	110.8683	97.4200	94.5411	99.8152	102.5530	117.2886	128.2364	145.8454	(45)
Energy content (annual)										Total = Sum(45)m =		1427.6696	
Distribution loss (46)m = 0.15 x (45)m	22.1773	19.4958	20.4776	17.5145	16.6302	14.6130	14.1812	14.9723	15.3830	17.5933	19.2355	21.8768	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	47.5719	42.0108	45.2632	42.0628	41.9682	39.0713	39.8351	41.0793	41.0138	44.0453	44.3887	47.4666	(61)
Total heat required for water heating calculated for each month	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(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	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(64)
										Total per year (kWh/year) = Sum(64)m =		1943.4464	(64)
12Total per year (kWh/year)												1943	(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	61.0527	53.7184	56.7079	49.3394	47.3558	42.1600	41.3937	43.4584	44.3523	50.0098	53.7358	60.3602	(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	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.5526	84.7546	76.5526	79.1043	76.5526	79.1043	76.5526	76.5526	79.1043	76.5526	79.1043	76.5526	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.8308	151.3856	147.4676	139.1267	128.5978	118.7021	112.0911	110.5364	114.4543	122.7953	133.3242	143.2199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	(71)
Water heating gains (Table 5)	82.0601	79.9381	76.2203	68.5270	63.6502	58.5555	55.6367	58.4118	61.6005	67.2175	74.6330	81.1293	(72)
Total internal gains	360.2370	367.8719	352.0340	338.5515	320.5941	305.1554	293.0739	294.2943	303.9527	318.3588	338.8550	352.6953	(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	6.0600	11.2829	0.6300	0.7000	0.7700	20.8962	(75)
East	1.2200	19.6403	0.6300	0.7000	0.7700	7.3228	(76)
Southeast	2.4300	36.7938	0.6300	0.7000	0.7700	27.3246	(77)

Solar gains	55.5436	103.4036	163.9087	239.1684	299.7226	311.2653	294.4090	247.3303	189.7730	120.4195	68.1520	46.4709	(83)
Total gains	415.7806	471.2755	515.9426	577.7199	620.3167	616.4207	587.4829	541.6246	493.7257	438.7784	407.0071	399.1663	(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	66.5811	66.7468	66.9100	67.6873	67.8348	68.5297	68.5297	68.6600	68.2603	67.8348	67.5371	67.2288	
alpha	5.4387	5.4498	5.4607	5.5125	5.5223	5.5686	5.5686	5.5773	5.5507	5.5223	5.5025	5.4819	
util living area													
	0.9914	0.9821	0.9594	0.8824	0.7276	0.5287	0.3859	0.4356	0.6870	0.9212	0.9817	0.9930	(86)
MIT	19.9793	20.1604	20.4153	20.7348	20.9264	20.9895	20.9985	20.9971	20.9595	20.7014	20.2920	19.9505	(87)
Th 2	20.0476	20.0498	20.0519	20.0618	20.0636	20.0722	20.0722	20.0738	20.0689	20.0636	20.0599	20.0560	(88)
util rest of house													
	0.9887	0.9767	0.9473	0.8510	0.6706	0.4555	0.3052	0.3492	0.6088	0.8922	0.9752	0.9908	(89)
MIT 2	18.8742	19.1043	19.4225	19.8068	20.0065	20.0667	20.0718	20.0728	20.0438	19.7803	19.2801	18.8439	(90)
Living area fraction										fLA = Living area / (4) =		0.6118	(91)
MIT	19.5503	19.7504	20.0299	20.3745	20.5693	20.6312	20.6387	20.6383	20.6040	20.3438	19.8992	19.5209	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5503	19.7504	20.0299	20.3745	20.5693	20.6312	20.6387	20.6383	20.6040	20.3438	19.8992	19.5209	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9870	0.9747	0.9470	0.8623	0.7023	0.5000	0.3546	0.4021	0.6550	0.9018	0.9739	0.9892	(94)
Useful gains	410.3605	459.3393	488.5856	498.1436	435.6323	308.2022	208.2992	217.7923	323.3716	395.7108	396.3802	394.8699	(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													
	811.2131	787.9812	716.1601	600.3916	463.0663	311.6985	208.7226	218.6218	337.4557	508.7266	671.1917	807.1160	(97)
Space heating kWh													
	298.2343	220.8474	169.3154	73.6186	20.4109	0.0000	0.0000	0.0000	0.0000	84.0838	197.8643	306.7111	(98a)
Space heating requirement - total per year (kWh/year)												1371.0858	
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													
	298.2343	220.8474	169.3154	73.6186	20.4109	0.0000	0.0000	0.0000	0.0000	84.0838	197.8643	306.7111	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1371.0858	
Space heating per m2											(98c) / (4) =	26.8840	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	298.2343	220.8474	169.3154	73.6186	20.4109	0.0000	0.0000	0.0000	0.0000	84.0838	197.8643	306.7111	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	322.7644	239.0123	183.2418	79.6738	22.0898	0.0000	0.0000	0.0000	0.0000	90.9997	214.1388	331.9385	(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													
	195.4208	171.9829	181.7807	158.8259	152.8365	136.4913	134.3762	140.8945	143.5668	161.3339	172.6251	193.3119	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.2842	84.9183	84.2294	82.8380	81.2257	80.3000	80.3000	80.3000	80.3000	83.0527	84.6746	85.3655	(217)
Fuel for water heating, kWh/month													
	229.1406	202.5274	215.8161	191.7307	188.1627	169.9767	167.3427	175.4601	178.7881	194.2549	203.8687	226.4522	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.9061	12.7605	11.4894	8.4176	6.5020	5.3122	5.9314	7.7098	10.0143	13.1393	14.8408	16.3482	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.5516	-25.6516	-38.2198	-44.6161	-49.5673	-46.8304	-46.2880	-42.9921	-37.3994	-30.0872	-19.6264	-15.0726	(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	-7.3397	-15.6762	-31.5889	-48.0684	-64.1516	-64.6442	-63.8531	-53.7682	-39.0425	-22.5903	-9.8577	-5.7844	(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	1483.8590	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2343.5207	(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)	128.3714	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-840.2676	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3201.4836	(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	1483.8590	0.2100	311.6104	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2343.5207	0.2100	492.1394	(264)
Space and water heating			803.7497	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.3714	0.1443	18.5280	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-413.9023	0.1338	-55.3835	
PV Unit electricity exported	-426.3653	0.1255	-53.5200	
Total			-108.9035	(269)
Total CO2, kg/year			725.3035	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.2200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1483.8590	1.1300	1676.7607	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2343.5207	1.1300	2648.1784	(278)
Space and water heating			4324.9391	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.3714	1.5338	196.9004	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-413.9023	1.4945	-618.5720	
PV Unit electricity exported	-426.3653	0.4608	-196.4481	
Total			-815.0202	(283)
Total Primary energy kWh/year			3836.9201	(286)
Target Primary Energy Rate (TPER)			75.2300	(287)

Full SAP Calculation Printout

Property Reference	Grosvenor 2BF MID 99 - Lean	**Issued on Date**	14/03/2024
Assessment Reference	Grosvenor 2BF MID 99 Lean	**Prop Type Ref**	2BF MID 99 - Be Lean
Property	Grosvenor Garage, Fitzgerald Avenue, East Sheen, London, SW14 8SZ		

SAP Rating	88 B	**DER**	9.19	**TER**	8.21
Environmental	92 A	**% DER < TER**			-11.94
CO_2 Emissions (t/year)	0.8	**DFEE**	16.98	**TFEE**	19.71
Compliance Check	See BREL	**% DFEE < TFEE**			13.85
% DPER < TPER	-21.40	**DPER**	51.78	**TPER**	42.65

Assessor Details	Mr. Ivan Ball	**Assessor ID**	X001-7283
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	99.0000	(1b)	x 2.5000	(2b) =	247.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.5000	(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) =	0.0808	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2308	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1789	(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	0.2281	0.2236	0.2191	0.1968	0.1923	0.1699	0.1699	0.1655	0.1789	0.1923	0.2012	0.2102	(22b)
Effective ac	0.5260	0.5250	0.5240	0.5194	0.5185	0.5144	0.5144	0.5137	0.5160	0.5185	0.5202	0.5221	(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	
Glazed Door/ Window (Uw = 1.20)			14.0800	1.1450	16.1221			(27)
External Wall 1	75.0000	14.0800	60.9200	0.1500	9.1380			(29a)
Total net area of external elements Aum(A, m2)			75.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.2601			(33)
Party Wall			33.8200	0.0000	0.0000			(32)
Party Floor 1			99.0000					(32d)
Party Ceiling			99.0000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.3300	0.0280	0.2332
E3 Sill	8.3300	0.0240	0.1999
E4 Jamb	18.0000	0.0190	0.3420
E16 Corner (normal)	10.0000	0.0370	0.3700
E18 Party wall between dwellings	5.0000	0.0410	0.2050
E7 Party floor between dwellings (in blocks of flats)	30.0000	0.0360	1.0800
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0790	-0.3950

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	2.0352	(36)
Point Thermal bridges (36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 27.2953 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	42.9616	42.8792	42.7983	42.4186	42.3475	42.0168	42.0168	41.9555	42.1442	42.3475	42.4912	42.6415	(38)
Heat transfer coeff	70.2569	70.1745	70.0936	69.7139	69.6428	69.3121	69.3121	69.2508	69.4395	69.6428	69.7865	69.9368	(39)
Average = Sum(39)m / 12 =												69.7135	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7097	0.7088	0.7080	0.7042	0.7035	0.7001	0.7001	0.6995	0.7014	0.7035	0.7049	0.7064	(40)
HLP (average)												0.7042	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7301 (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

80.7296	79.5307	77.8423	74.7293	72.3982	69.8135	68.4174	70.0939	71.9194	74.6852	77.8623	80.4567	(42b)

Hot water usage for other uses

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

Average daily hot water use (litres/day) 113.5661 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.3183	120.5707	117.3336	112.6719	108.7922	104.6588	103.2627	106.4879	109.8621	114.1765	118.9023	123.0454	(44)
Energy conte	195.3061	171.6911	180.3374	154.2422	146.4552	128.6902	124.8872	131.8543	135.4709	154.9364	169.3982	192.6594	(45)
Energy content (annual)										Total = Sum(45)m =		1885.9285	
Distribution loss (46)m = 0.15 x (45)m	29.2959	25.7537	27.0506	23.1363	21.9683	19.3035	18.7331	19.7781	20.3206	23.2405	25.4097	28.8989	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	246.2650	217.7185	231.2963	203.5573	197.4141	178.0053	175.8461	182.8132	184.7860	205.8953	218.7132	243.6183	(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	246.2650	217.7185	231.2963	203.5573	197.4141	178.0053	175.8461	182.8132	184.7860	205.8953	218.7132	243.6183	(64)
										Total per year (kWh/year) = Sum(64)m =		2485.9285	(64)
12Total per year (kWh/year)												2486	(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	77.6790	68.5941	72.7019	63.6143	61.4361	55.1183	54.2647	56.5813	57.3728	64.2561	68.6537	76.7990	(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	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	137.3519	152.0682	137.3519	141.9303	137.3519	141.9303	137.3519	137.3519	141.9303	137.3519	141.9303	137.3519	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)
Water heating gains (Table 5)	104.4073	102.0746	97.7176	88.3532	82.5754	76.5531	72.9365	76.0501	79.6845	86.3657	95.3523	103.2244	(72)
Total internal gains	563.4112	578.4378	552.7043	533.7394	505.4848	484.2190	464.7859	465.2565	480.1296	499.4113	530.8747	550.9903	(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	
Southeast	12.2600	36.7938	0.5400	0.7000	0.7700	118.1655	(77)
Northwest	1.8200	11.2829	0.5400	0.7000	0.7700	5.3792	(81)

Solar gains	123.5447	212.2290	295.1270	373.6316	425.7594	425.8743	409.2592	369.8812	322.2377	235.8379	148.3034	105.5179	(83)
Total gains	686.9559	790.6669	847.8313	907.3709	931.2442	910.0934	874.0451	835.1377	802.3672	735.2492	679.1781	656.5082	(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	97.8551	97.9701	98.0831	98.6174	98.7180	99.1891	99.1891	99.2768	99.0071	98.7180	98.5147	98.3030	
alpha	7.5237	7.5313	7.5389	7.5745	7.5812	7.6126	7.6126	7.6185	7.6005	7.5812	7.5676	7.5535	
util living area	0.9925	0.9786	0.9463	0.8487	0.6814	0.4864	0.3488	0.3813	0.5923	0.8767	0.9788	0.9945	(86)
MIT	20.4214	20.5807	20.7479	20.9134	20.9845	20.9989	20.9999	20.9998	20.9954	20.9061	20.6403	20.3851	(87)

Th 2	20.3323	20.3330	20.3338	20.3371	20.3378	20.3407	20.3407	20.3413	20.3396	20.3378	20.3365	20.3352	(88)
util rest of house	0.9904	0.9729	0.9331	0.8190	0.6374	0.4368	0.2966	0.3268	0.5377	0.8448	0.9722	0.9929	(89)
MIT 2	19.6586	19.8590	20.0639	20.2552	20.3258	20.3401	20.3407	20.3412	20.3368	20.2515	19.9382	19.6148	(90)
Living area fraction										fLA = Living area / (4) =		0.3152	(91)
MIT	19.8990	20.0865	20.2795	20.4626	20.5334	20.5477	20.5485	20.5488	20.5444	20.4578	20.1594	19.8576	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7490	19.9365	20.1295	20.3126	20.3834	20.3977	20.3985	20.3988	20.3944	20.3078	20.0094	19.7076	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9880	0.9688	0.9284	0.8178	0.6405	0.4411	0.3012	0.3315	0.5423	0.8432	0.9682	0.9910	(94)
Useful gains	678.7156	766.0121	787.1463	742.0523	596.4974	401.4060	263.2589	276.8780	435.0996	619.9585	657.5494	650.5830	(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	1085.3985	1055.1750	955.3405	795.6181	604.7340	401.8515	263.2787	276.9192	437.0768	676.0783	900.9054	1084.5487	(97)
Space heating kWh	302.5720	194.3175	125.1364	38.5674	6.1280	0.0000	0.0000	0.0000	0.0000	41.7531	175.2164	322.8705	(98a)
Space heating requirement - total per year (kWh/year)												1206.5614	
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	302.5720	194.3175	125.1364	38.5674	6.1280	0.0000	0.0000	0.0000	0.0000	41.7531	175.2164	322.8705	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1206.5614	
Space heating per m2											(98c) / (4) =	12.1875	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.5000	(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	302.5720	194.3175	125.1364	38.5674	6.1280	0.0000	0.0000	0.0000	0.0000	41.7531	175.2164	322.8705	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	338.0693	217.1145	139.8172	43.0921	6.8470	0.0000	0.0000	0.0000	0.0000	46.6515	195.7725	360.7492	(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	246.2650	217.7185	231.2963	203.5573	197.4141	178.0053	175.8461	182.8132	184.7860	205.8953	218.7132	243.6183	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	275.1564	243.2608	258.4317	227.4383	220.5745	198.8886	196.4761	204.2605	206.4648	230.0506	244.3723	272.1992	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.9733	21.6389	19.4835	14.2744	11.0260	9.0083	10.0583	13.0741	16.9820	22.2813	25.1667	27.7229	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1348.1133	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2777.5738	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												217.6896	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												4429.3767	(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	1348.1133	0.2100	283.1038	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2777.5738	0.2100	583.2905	(264)
Space and water heating			866.3943	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	217.6896	0.1443	31.4193	(268)
Total CO2, kg/year			909.7429	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.1900	(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	1348.1133	1.1300	1523.3680	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2777.5738	1.1300	3138.6584	(278)
Space and water heating			4662.0264	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	217.6896	1.5338	333.8996	(282)
Total Primary energy kWh/year			5126.0269	(286)
Dwelling Primary energy Rate (DPER)			51.7800	(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	99.0000	(1b)	x 2.5000	(2b) =	247.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	247.5000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1212 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3712 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2877 (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	0.3668	0.3596	0.3524	0.3165	0.3093	0.2733	0.2733	0.2661	0.2877	0.3093	0.3237	0.3380	(22b)
Effective ac	0.5673	0.5647	0.5621	0.5501	0.5478	0.5373	0.5373	0.5354	0.5414	0.5478	0.5524	0.5571	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			14.0800	1.1450	16.1221			(27)
External Wall 1	75.0000	14.0800	60.9200	0.1800	10.9656			(29a)
Total net area of external elements Aum(A, m2)			75.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.0877			(33)
Party Wall			33.8200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

		Length	Psi-value	Total
K1	Element			
E2	Other lintels (including other steel lintels)	8.3300	0.0500	0.4165
E3	Sill	8.3300	0.0500	0.4165
E4	Jamb	18.0000	0.0500	0.9000
E16	Corner (normal)	10.0000	0.0900	0.9000
E18	Party wall between dwellings	5.0000	0.0600	0.3000
E7	Party floor between dwellings (in blocks of flats)	30.0000	0.0700	2.1000
E17	Corner (inverted - internal area greater than external area)	5.0000	-0.0900	-0.4500

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.5830 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 31.6707 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.3320	46.1186	45.9095	44.9272	44.7434	43.8879	43.8879	43.7294	44.2174	44.7434	45.1152	45.5039	(38)
Heat transfer coeff	78.0027	77.7894	77.5802	76.5979	76.4142	75.5586	75.5586	75.4002	75.8882	76.4142	76.7860	77.1746	(39)

Average = Sum(39)m / 12 = 76.5971

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7879	0.7858	0.7836	0.7737	0.7719	0.7632	0.7632	0.7616	0.7665	0.7719	0.7756	0.7795	(40)
HLP (average)												0.7737	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7301 (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	80.7296	79.5307	77.8423	74.7293	72.3982	69.8135	68.4174	70.0939	71.9194	74.6852	77.8623	80.4567	(42b)
Hot water usage for other uses	42.5887	41.0400	39.4913	37.9426	36.3940	34.8453	34.8453	36.3940	37.9426	39.4913	41.0400	42.5887	(42c)

Average daily hot water use (litres/day) 113.5661 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.3183	120.5707	117.3336	112.6719	108.7922	104.6588	103.2627	106.4879	109.8621	114.1765	118.9023	123.0454	(44)
Energy conte	195.3061	171.6911	180.3374	154.2422	146.4552	128.6902	124.8872	131.8543	135.4709	154.9364	169.3982	192.6594	(45)

Energy content (annual) Total = Sum(45)m = 1885.9285

Distribution loss (46)m = 0.15 x (45)m	29.2959	25.7537	27.0506	23.1363	21.9683	19.3035	18.7331	19.7781	20.3206	23.2405	25.4097	28.8989	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	246.2650	217.7185	231.2963	203.5573	197.4141	178.0053	175.8461	182.8132	184.7860	205.8953	218.7132	243.6183	(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	246.2650	217.7185	231.2963	203.5573	197.4141	178.0053	175.8461	182.8132	184.7860	205.8953	218.7132	243.6183	(64)

Total per year (kWh/year) = Sum(64)m = 2485.9285 (64)

12Total per year (kWh/year) 2486 (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	77.6790	68.5941	72.7019	63.6143	61.4361	55.1183	54.2647	56.5813	57.3728	64.2561	68.6537	76.7990	(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	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	137.3519	152.0682	137.3519	141.9303	137.3519	141.9303	137.3519	137.3519	141.9303	137.3519	141.9303	137.3519	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)
Water heating gains (Table 5)	104.4073	102.0746	97.7176	88.3532	82.5754	76.5531	72.9365	76.0501	79.6845	86.3657	95.3523	103.2244	(72)
Total internal gains	563.4112	578.4378	552.7043	533.7394	505.4848	484.2190	464.7859	465.2565	480.1296	499.4113	530.8747	550.9903	(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	
Southeast	12.2600	36.7938	0.6300	0.7000	0.7700	137.8597	(77)
Northwest	1.8200	11.2829	0.6300	0.7000	0.7700	6.2757	(81)

Solar gains	144.1354	247.6005	344.3148	435.9035	496.7193	496.8534	477.4690	431.5281	375.9439	275.1442	173.0207	123.1043	(83)
Total gains	707.5467	826.0384	897.0191	969.6428	1002.2041	981.0724	942.2549	896.7846	856.0735	774.5556	703.8953	674.0946	(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	88.1379	88.3797	88.6179	89.7544	89.9702	90.9890	90.9890	91.1801	90.5938	89.9702	89.5346	89.0837	
alpha	6.8759	6.8920	6.9079	6.9836	6.9980	7.0659	7.0659	7.0787	7.0396	6.9980	6.9690	6.9389	
util living area	0.9931	0.9799	0.9491	0.8541	0.6892	0.4912	0.3527	0.3865	0.6041	0.8859	0.9806	0.9948	(86)

MIT	20.3044	20.4863	20.6826	20.8853	20.9768	20.9981	20.9998	20.9997	20.9924	20.8738	20.5618	20.2732	(87)
Th 2	20.2638	20.2657	20.2675	20.2762	20.2778	20.2853	20.2853	20.2867	20.2824	20.2778	20.2745	20.2711	(88)
util rest of house													
	0.9910	0.9744	0.9359	0.8234	0.6420	0.4371	0.2955	0.3267	0.5444	0.8538	0.9743	0.9933	(89)
MIT 2	19.4546	19.6847	19.9273	20.1673	20.2599	20.2843	20.2853	20.2866	20.2778	20.1611	19.7887	19.4208	(90)
Living area fraction										fLA = Living area / (4) =		0.3152	(91)
MIT	19.7224	19.9373	20.1653	20.3936	20.4858	20.5092	20.5105	20.5113	20.5030	20.3857	20.0323	19.6894	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7224	19.9373	20.1653	20.3936	20.4858	20.5092	20.5105	20.5113	20.5030	20.3857	20.0323	19.6894	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9891	0.9715	0.9338	0.8287	0.6559	0.4542	0.3135	0.3456	0.5630	0.8590	0.9717	0.9917	(94)
Useful gains	699.8510	802.4553	837.6651	803.5626	657.3657	445.5570	295.4136	309.8860	481.9711	665.3747	683.9867	668.5151	(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													
	1202.9906	1169.7456	1060.1588	880.3871	671.3602	446.4927	295.4696	309.9961	485.9123	747.7669	993.0207	1195.3909	(97)
Space heating kWh													
	374.3359	246.8191	165.5354	55.3136	10.4119	0.0000	0.0000	0.0000	0.0000	61.2998	222.5045	391.9956	(98a)
Space heating requirement - total per year (kWh/year)												1528.2158	
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													
	374.3359	246.8191	165.5354	55.3136	10.4119	0.0000	0.0000	0.0000	0.0000	61.2998	222.5045	391.9956	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1528.2158	
Space heating per m2											(98c) / (4) =	15.4365	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	374.3359	246.8191	165.5354	55.3136	10.4119	0.0000	0.0000	0.0000	0.0000	61.2998	222.5045	391.9956	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	405.1254	267.1202	179.1508	59.8632	11.2683	0.0000	0.0000	0.0000	0.0000	66.3418	240.8057	424.2377	(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													
	246.2650	217.7185	231.2963	203.5573	197.4141	178.0053	175.8461	182.8132	184.7860	205.8953	218.7132	243.6183	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.2759	84.6510	83.6766	81.9949	80.6911	80.3000	80.3000	80.3000	80.3000	82.1226	84.4183	85.3947	(217)
Fuel for water heating, kWh/month													
	288.7861	257.1954	276.4168	248.2562	244.6543	221.6753	218.9865	227.6627	230.1195	250.7170	259.0827	285.2851	(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	28.5390	22.8951	20.6145	15.1030	11.6660	9.5312	10.6421	13.8331	17.9678	23.5747	26.6275	29.3322	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-33.0171	-47.6975	-70.2187	-80.8997	-88.8764	-83.5156	-82.4658	-77.0413	-67.7470	-55.3995	-36.6970	-28.4105	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-15.3014	-32.5270	-65.2922	-99.0172	-131.8719	-132.8763	-131.3376	-110.7875	-80.6403	-46.8569	-20.5368	-12.0765	(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												1653.9132	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												3008.8377	(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)												230.3262	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1631.1077	(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												3347.9694	(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	1653.9132	0.2100	347.3218	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3008.8377	0.2100	631.8559	(264)
Space and water heating			979.1777	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	230.3262	0.1443	33.2432	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-751.9860	0.1341	-100.8330	
PV Unit electricity exported	-879.1216	0.1256	-110.4241	
Total			-211.2571	(269)
Total CO2, kg/year			813.0930	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.2100	(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	1653.9132	1.1300	1868.9219	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3008.8377	1.1300	3399.9866	(278)
Space and water heating			5268.9084	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	230.3262	1.5338	353.2821	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-751.9860	1.4955	-1124.6268	
PV Unit electricity exported	-879.1216	0.4611	-405.3200	
Total			-1529.9468	(283)
Total Primary energy kWh/year			4222.3445	(286)
Target Primary Energy Rate (TPER)			42.6500	(287)

Full SAP Calculation Printout

Property Reference	Grosvenor 2BF Top 76 - Lean	**Issued on Date**	14/03/2024
Assessment Reference	Grosvenor 2BF TOP 76 Lean	**Prop Type Ref**	2BF TOP 76 - Be Lean
Property	Grosvenor Garage, Fitzgerald Avenue, East Sheen, London, SW14 8SZ		

SAP Rating	86 B	**DER**	12.09	**TER**	11.94
Environmental	90 B	**% DER < TER**			-1.26
CO_2 Emissions (t/year)	0.81	**DFEE**	24.26	**TFEE**	29.60
Compliance Check	See BREL	**% DFEE < TFEE**			18.05
% DPER < TPER	-7.89	**DPER**	67.89	**TPER**	62.93

Assessor Details	Mr. Ivan Ball	**Assessor ID**	X001-7283
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	76.0000	(1b)	x 2.5000	(2b) =	190.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		190.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	1 * 10 =	10.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	10.0000 / (5) =	0.0526	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2026	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1570	(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	0.2002	0.1963	0.1924	0.1727	0.1688	0.1492	0.1492	0.1453	0.1570	0.1688	0.1767	0.1845	(22b)
Effective ac	0.5200	0.5193	0.5185	0.5149	0.5142	0.5111	0.5111	0.5106	0.5123	0.5142	0.5156	0.5170	(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	
Glazed Door/ Window (Uw = 1.20)			7.0000	1.1450	8.0153			(27)
External Wall 1	76.9000	7.0000	69.9000	0.1500	10.4850			(29a)
Roof	76.0000		76.0000	0.1200	9.1200			(30)
Total net area of external elements Aum(A, m2)			152.9000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.6203			(33)
Party Wall			24.5300	0.0000	0.0000			(32)
Party Floor 1			76.0000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1800	0.0280	0.1450
E3 Sill	5.1800	0.0240	0.1243
E4 Jamb	16.2000	0.0190	0.3078
E16 Corner (normal)	35.0000	0.0370	1.2950
E18 Party wall between dwellings	5.0000	0.0410	0.2050
E7 Party floor between dwellings (in blocks of flats)	30.7600	0.0360	1.1074
E17 Corner (inverted - internal area greater than external area)	30.0000	-0.0790	-2.3700
E14 Flat roof	30.7600	0.0410	1.2612
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			2.0757 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 29.6959 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.6068	32.5580	32.5102	32.2855	32.2435	32.0478	32.0478	32.0115	32.1231	32.2435	32.3285	32.4174	(38)
Heat transfer coeff	62.3028	62.2540	62.2061	61.9814	61.9394	61.7437	61.7437	61.7075	61.8191	61.9394	62.0244	62.1134	(39)
Average = Sum(39)m / 12 =												61.9812	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8198	0.8191	0.8185	0.8155	0.8150	0.8124	0.8124	0.8119	0.8134	0.8150	0.8161	0.8173	(40)
HLP (average)												0.8155	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3826 (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	73.9840	72.8853	71.3380	68.4851	66.3488	63.9801	62.7006	64.2370	65.9100	68.4446	71.3563	73.7339	(42b)
Hot water usage for other uses	39.0301	37.6108	36.1915	34.7722	33.3530	31.9337	31.9337	33.3530	34.7722	36.1915	37.6108	39.0301	(42c)
Average daily hot water use (litres/day)												104.0768	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.0141	110.4961	107.5295	103.2573	99.7018	95.9137	94.6343	97.5900	100.6822	104.6361	108.9671	112.7640	(44)
Energy conte	178.9867	157.3449	165.2688	141.3541	134.2178	117.9371	114.4519	120.8368	124.1513	141.9903	155.2436	176.5612	(45)
Energy content (annual)										Total = Sum(45)m =		1728.3446	
Distribution loss (46)m = 0.15 x (45)m	26.8480	23.6017	24.7903	21.2031	20.1327	17.6906	17.1678	18.1255	18.6227	21.2985	23.2865	26.4842	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.8069	47.2999	48.2246	49.7308	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	229.9456	203.3723	216.2277	190.6691	185.0247	165.2371	162.6765	170.5676	173.4663	192.9492	204.5587	227.5201	(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	229.9456	203.3723	216.2277	190.6691	185.0247	165.2371	162.6765	170.5676	173.4663	192.9492	204.5587	227.5201	(64)
										Total per year (kWh/year) = Sum(64)m =		2322.2150	(64)
12Total per year (kWh/year)												2322	(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	72.2528	63.8240	67.6916	59.3290	57.3291	51.0391	50.1114	52.6109	53.6091	59.9515	63.9473	71.4463	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.9231	138.3077	124.9231	129.0872	124.9231	129.0872	124.9231	124.9231	129.0872	124.9231	129.0872	124.9231	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	210.8782	213.0665	207.5522	195.8128	180.9940	167.0663	157.7618	155.5736	161.0879	172.8273	187.6461	201.5737	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	(71)
Water heating gains (Table 5)	97.1140	94.9762	90.9834	82.4014	77.0553	70.8876	67.3541	70.7136	74.4570	80.5800	88.8157	96.0300	(72)
Total internal gains	494.6542	508.0893	485.1974	469.0402	444.7112	425.7800	408.7778	409.9491	423.3710	440.0692	467.2878	484.2657	(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	
Southeast	4.5700	36.7938	0.5400	0.7000	0.7700	44.0470	(77)
Northwest	2.4300	11.2829	0.5400	0.7000	0.7700	7.1821	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	51.2291	89.6478	128.9966	170.4542	200.6174	203.4309	194.3545	171.1995	143.2511	100.7884	61.7951	43.5603	(83)
Total gains	545.8833	597.7371	614.1941	639.4944	645.3286	629.2109	603.1323	581.1486	566.6220	540.8576	529.0829	527.8260	(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	84.7118	84.7782	84.8434	85.1509	85.2087	85.4788	85.4788	85.5290	85.3746	85.2087	85.0919	84.9701	
alpha	6.6475	6.6519	6.6562	6.6767	6.6806	6.6986	6.6986	6.7019	6.6916	6.6806	6.6728	6.6647	
util living area	0.9934	0.9868	0.9739	0.9280	0.8155	0.6174	0.4492	0.4864	0.7214	0.9325	0.9848	0.9947	(86)

MIT	20.2524	20.3809	20.5439	20.7649	20.9253	20.9899	20.9989	20.9982	20.9733	20.7900	20.4877	20.2215 (87)
Th 2	20.2362	20.2368	20.2373	20.2399	20.2404	20.2426	20.2426	20.2430	20.2417	20.2404	20.2394	20.2384 (88)
util rest of house	0.9915	0.9829	0.9661	0.9070	0.7697	0.5489	0.3726	0.4075	0.6542	0.9086	0.9796	0.9931 (89)
MIT 2	19.3665	19.5295	19.7342	20.0031	20.1781	20.2368	20.2422	20.2423	20.2244	20.0367	19.6677	19.3290 (90)
Living area fraction										fLA = Living area / (4) =		0.4105 (91)
MIT	19.7302	19.8790	20.0666	20.3158	20.4848	20.5460	20.5529	20.5526	20.5318	20.3459	20.0043	19.6954 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.5802	19.7290	19.9166	20.1658	20.3348	20.3960	20.4029	20.4026	20.3818	20.1959	19.8543	19.5454 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9893	0.9797	0.9621	0.9047	0.7758	0.5631	0.3889	0.4242	0.6671	0.9070	0.9763	0.9912	(94)
Useful gains	540.0255	585.6057	590.8990	578.5268	500.6380	354.2971	234.5445	246.5327	378.0214	490.5609	516.5462	523.1902	(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	951.9965	923.1658	834.5964	698.2730	534.8374	357.8654	234.8030	246.9924	388.3361	594.3646	791.0803	953.1543	(97)
Space heating kWh	306.5065	226.8404	181.3109	86.2172	25.4444	0.0000	0.0000	0.0000	0.0000	77.2299	197.6646	319.8933	(98a)
Space heating requirement - total per year (kWh/year)												1421.1072	
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	306.5065	226.8404	181.3109	86.2172	25.4444	0.0000	0.0000	0.0000	0.0000	77.2299	197.6646	319.8933	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1421.1072	
Space heating per m2											(98c) / (4) =	18.6988	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	89.5000 (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	306.5065	226.8404	181.3109	86.2172	25.4444	0.0000	0.0000	0.0000	0.0000	77.2299	197.6646	319.8933	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	342.4653	253.4530	202.5820	96.3321	28.4295	0.0000	0.0000	0.0000	0.0000	86.2904	220.8543	357.4227	(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	229.9456	203.3723	216.2277	190.6691	185.0247	165.2371	162.6765	170.5676	173.4663	192.9492	204.5587	227.5201	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	256.9225	227.2317	241.5952	213.0382	206.7315	184.6224	181.7615	190.5784	193.8171	215.5857	228.5572	254.2124	(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	24.5325	19.6809	17.7204	12.9828	10.0283	8.1932	9.1481	11.8911	15.4453	20.2651	22.8894	25.2143	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year	
Space heating fuel - main system 1	1587.8293 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	89.5000
Water heating fuel used	2594.6537 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	197.9912 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4466.4741 (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	1587.8293	0.2100	333.4441	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2594.6537	0.2100	544.8773	(264)
Space and water heating			878.3214	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	197.9912	0.1443	28.5762	(268)
Total CO2, kg/year			918.8269	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.0900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1587.8293	1.1300	1794.2471	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2594.6537	1.1300	2931.9587	(278)
Space and water heating			4726.2057	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	197.9912	1.5338	303.6855	(282)
Total Primary energy kWh/year			5159.9920	(286)
Dwelling Primary energy Rate (DPER)			67.8900	(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	76.0000	(1b)	x 2.5000	(2b) =	190.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.0000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	190.0000	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1579	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4079	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3161	(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	0.4031	0.3951	0.3872	0.3477	0.3398	0.3003	0.3003	0.2924	0.3161	0.3398	0.3556	0.3714	(22b)
Effective ac	0.5812	0.5781	0.5750	0.5605	0.5577	0.5451	0.5451	0.5428	0.5500	0.5577	0.5632	0.5690	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			7.0000	1.1450	8.0153			(27)
External Wall 1	76.9000	7.0000	69.9000	0.1800	12.5820			(29a)
Roof	76.0000		76.0000	0.1100	8.3600			(30)
Total net area of external elements Aum(A, m2)			152.9000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.9573			(33)
Party Wall			24.5300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

		Length	Psi-value	Total
K1	Element			
E2	Other lintels (including other steel lintels)	5.1800	0.0500	0.2590
E3	Sill	5.1800	0.0500	0.2590
E4	Jamb	16.2000	0.0500	0.8100
E16	Corner (normal)	35.0000	0.0900	3.1500
E18	Party wall between dwellings	5.0000	0.0600	0.3000

E7 Party floor between dwellings (in blocks of flats)	30.7600	0.0700	2.1532	
E17 Corner (inverted - internal area greater than external area)	30.0000	-0.0900	-2.7000	
E14 Flat roof	30.7600	0.0800	2.4608	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6920 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.6493 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.4428	36.2451	36.0512	35.1407	34.9704	34.1774	34.1774	34.0305	34.4828	34.9704	35.3150	35.6753	(38)
Heat transfer coeff	72.0921	71.8943	71.7005	70.7900	70.6196	69.8266	69.8266	69.6798	70.1321	70.6196	70.9643	71.3245	(39)

Average = Sum(39)m / 12 = 70.7892

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9486	0.9460	0.9434	0.9314	0.9292	0.9188	0.9188	0.9168	0.9228	0.9292	0.9337	0.9385	(40)
HLP (average)												0.9314	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3826 (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

73.9840	72.8853	71.3380	68.4851	66.3488	63.9801	62.7006	64.2370	65.9100	68.4446	71.3563	73.7339	(42b)

Hot water usage for other uses

39.0301	37.6108	36.1915	34.7722	33.3530	31.9337	31.9337	33.3530	34.7722	36.1915	37.6108	39.0301	(42c)

Average daily hot water use (litres/day) 104.0768 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.0141	110.4961	107.5295	103.2573	99.7018	95.9137	94.6343	97.5900	100.6822	104.6361	108.9671	112.7640	(44)
Energy conte	178.9867	157.3449	165.2688	141.3541	134.2178	117.9371	114.4519	120.8368	124.1513	141.9903	155.2436	176.5612	(45)
Energy content (annual)											Total = Sum(45)m =	1728.3446	
Distribution loss (46)m = 0.15 x (45)m	26.8480	23.6017	24.7903	21.2031	20.1327	17.6906	17.1678	18.1255	18.6227	21.2985	23.2865	26.4842	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.8069	47.2999	48.2246	49.7308	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	229.9456	203.3723	216.2277	190.6691	185.0247	165.2371	162.6765	170.5676	173.4663	192.9492	204.5587	227.5201	(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	229.9456	203.3723	216.2277	190.6691	185.0247	165.2371	162.6765	170.5676	173.4663	192.9492	204.5587	227.5201	(64)
										Total per year (kWh/year) = Sum(64)m =		2322.2150	(64)
12Total per year (kWh/year)												2322	(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	72.2528	63.8240	67.6916	59.3290	57.3291	51.0391	50.1114	52.6109	53.6091	59.9515	63.9473	71.4463	(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	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.9231	138.3077	124.9231	129.0872	124.9231	129.0872	124.9231	124.9231	129.0872	124.9231	129.0872	124.9231	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	210.8782	213.0665	207.5522	195.8128	180.9940	167.0663	157.7618	155.5736	161.0879	172.8273	187.6461	201.5737	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	(71)
Water heating gains (Table 5)	97.1140	94.9762	90.9834	82.4014	77.0553	70.8876	67.3541	70.7136	74.4570	80.5800	88.8157	96.0300	(72)
Total internal gains	494.6542	508.0893	485.1974	469.0402	444.7112	425.7800	408.7778	409.9491	423.3710	440.0692	467.2878	484.2657	(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	
Southeast	4.5700	36.7938	0.6300	0.7000	0.7700	51.3882	(77)
Northwest	2.4300	11.2829	0.6300	0.7000	0.7700	8.3792	(81)

Solar gains	59.7673	104.5891	150.4961	198.8632	234.0536	237.3361	226.7469	199.7327	167.1262	117.5865	72.0943	50.8204	(83)
Total gains	554.4215	612.6784	635.6935	667.9035	678.7648	663.1161	635.5248	609.6819	590.4972	557.6556	539.3821	535.0861	(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	73.2088	73.4102	73.6087	74.5554	74.7353	75.5840	75.5840	75.7433	75.2548	74.7353	74.3723	73.9967	

alpha	5.8806	5.8940	5.9072	5.9704	5.9824	6.0389	6.0389	6.0496	6.0170	5.9824	5.9582	5.9331	
util living area	0.9943	0.9888	0.9780	0.9394	0.8423	0.6523	0.4803	0.5206	0.7602	0.9457	0.9874	0.9954	(86)
MIT	20.0444	20.1918	20.3875	20.6635	20.8750	20.9789	20.9971	20.9954	20.9485	20.6957	20.3336	20.0235	(87)
Th 2	20.1264	20.1286	20.1307	20.1409	20.1427	20.1516	20.1516	20.1532	20.1482	20.1427	20.1389	20.1349	(88)
util rest of house	0.9926	0.9853	0.9710	0.9199	0.7958	0.5749	0.3894	0.4275	0.6877	0.9242	0.9829	0.9939	(89)
MIT 2	19.0167	19.2054	19.4535	19.7990	20.0371	20.1394	20.1506	20.1515	20.1140	19.8438	19.3944	18.9966	(90)
Living area fraction									fLA = Living area / (4) =			0.4105	(91)
MIT	19.4386	19.6103	19.8369	20.1539	20.3811	20.4840	20.4981	20.4979	20.4566	20.1936	19.7800	19.4181	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4386	19.6103	19.8369	20.1539	20.3811	20.4840	20.4981	20.4979	20.4566	20.1936	19.7800	19.4181	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9907	0.9828	0.9680	0.9202	0.8097	0.6060	0.4268	0.4658	0.7154	0.9257	0.9805	0.9923	(94)
Useful gains	549.2898	602.1100	615.3820	614.6334	549.6222	401.8737	271.2598	283.9933	422.4165	516.2319	528.8425	530.9729	(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	1091.3701	1057.5884	956.2638	796.6640	613.0534	410.8625	272.1915	285.5438	445.7992	677.4937	899.8248	1085.4265	(97)
Space heating kWh	403.3078	306.0815	253.6160	131.0620	47.1928	0.0000	0.0000	0.0000	0.0000	119.9788	267.1072	412.5135	(98a)
Space heating requirement - total per year (kWh/year)												1940.8596	
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	403.3078	306.0815	253.6160	131.0620	47.1928	0.0000	0.0000	0.0000	0.0000	119.9788	267.1072	412.5135	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1940.8596	
Space heating per m2											(98c) / (4) =	25.5376	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	403.3078	306.0815	253.6160	131.0620	47.1928	0.0000	0.0000	0.0000	0.0000	119.9788	267.1072	412.5135	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	436.4803	331.2570	274.4762	141.8420	51.0745	0.0000	0.0000	0.0000	0.0000	129.8472	289.0771	446.4431	(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	229.9456	203.3723	216.2277	190.6691	185.0247	165.2371	162.6765	170.5676	173.4663	192.9492	204.5587	227.5201	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.5722	85.2551	84.7241	83.5943	81.9103	80.3000	80.3000	80.3000	80.3000	83.3930	84.9541	85.6396	(217)
Fuel for water heating, kWh/month	268.7155	238.5458	255.2139	228.0888	225.8869	205.7747	202.5860	212.4130	216.0228	231.3732	240.7874	265.6717	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.9566	20.8233	18.7491	13.7364	10.6104	8.6688	9.6791	12.5813	16.3419	21.4414	24.2181	26.6780	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-25.8150	-37.5352	-55.6094	-64.4928	-71.2300	-67.0936	-66.2904	-61.7788	-54.0563	-43.8331	-28.7918	-22.1887	(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	-11.2780	-24.0513	-48.4191	-73.6253	-98.2334	-99.0255	-97.8414	-82.4130	-59.8572	-34.6668	-15.1453	-8.8923	(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												2100.4974	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2791.0796	(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)												209.4843	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1252.1635	(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												3934.8978	(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	2100.4974	0.2100	441.1045	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2791.0796	0.2100	586.1267	(264)
Space and water heating			1027.2312	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	209.4843	0.1443	30.2351	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-598.7150	0.1339	-80.1957	
PV Unit electricity exported	-653.4485	0.1255	-82.0325	
Total			-162.2282	(269)
Total CO2, kg/year			907.1673	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9400	(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	2100.4974	1.1300	2373.5621	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2791.0796	1.1300	3153.9199	(278)
Space and water heating			5527.4820	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	209.4843	1.5338	321.3140	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-598.7150	1.4950	-895.0832	
PV Unit electricity exported	-653.4485	0.4608	-301.1047	
Total			-1196.1879	(283)
Total Primary energy kWh/year			4782.7090	(286)
Target Primary Energy Rate (TPER)			62.9300	(287)

Full SAP Calculation Printout

Property Reference	Grosvenor 3BH END 150 - Lean	**Issued on Date**	13/03/2024
Assessment Reference	Grosvenor 3BH END 150 Lean	**Prop Type Ref**	3BH END 150 - Be Lean
Property	Grosvenor Garages, Fitzgerald Avenue, East Sheen, London, SW14 8SZ		

SAP Rating	87 B	**DER**	11.31	**TER**	9.79
Environmental	89 B	**% DER < TER**			-15.53
CO_2 Emissions (t/year)	1.43	**DFEE**	33.66	**TFEE**	38.24
Compliance Check	See BREL	**% DFEE < TFEE**			11.99
% DPER < TPER	-22.25	**DPER**	62.64	**TPER**	51.24

Assessor Details	Mr. Ivan Ball	**Assessor ID**	X001-7283
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.8800	(1b)	x 2.5000	(2b) =	162.2000	(1b) - (3b)
First floor	46.5500	(1c)	x 2.5000	(2c) =	116.3750	(1c) - (3c)
Second floor	39.1600	(1d)	x 2.5000	(2d) =	97.9000	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.5900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		376.4750	(5)

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2. Ventilation rate

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

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.0797 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2297 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1780 (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	0.2270	0.2225	0.2181	0.1958	0.1914	0.1691	0.1691	0.1647	0.1780	0.1914	0.2003	0.2092	(22b)
Effective ac	0.5258	0.5248	0.5238	0.5192	0.5183	0.5143	0.5143	0.5136	0.5158	0.5183	0.5201	0.5219	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Opening Type 1 (Uw = 1.20)			22.2700	1.1450	25.5000			(27)
Heatloss Floor 1			64.8800	0.1100	7.1368			(28a)
External Wall 1	165.1300	19.8400	145.2900	0.1500	21.7935			(29a)
Low Level Walls inc Dormers	15.3100	2.4300	12.8800	0.1500	1.9320			(29a)
Flat Roof	64.8800		64.8800	0.1200	7.7856			(30)
Total net area of external elements Aum(A, m2)			310.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		64.1479			(33)
Party Wall 1			87.9300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	24.6200	0.0460	1.1325
E2 Other lintels (including other steel lintels)	14.5800	0.0280	0.4082
E3 Sill	9.6800	0.0240	0.2323
E4 Jamb	25.2000	0.0190	0.4788
E6 Intermediate floor within a dwelling	41.4300	0.0000	0.0000
E18 Party wall between dwellings	15.0000	0.0410	0.6150

P1 Party wall - Ground floor	13.2300	0.1600	2.1168	
P2 Party wall - Intermediate floor within a dwelling	21.9400	0.0000	0.0000	
E16 Corner (normal)	27.5000	0.0370	1.0175	
E14 Flat roof	31.5700	0.0410	1.2944	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.2955 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 71.4434 (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	65.3181	65.1939	65.0721	64.5000	64.3930	63.8948	63.8948	63.8025	64.0867	64.3930	64.6095	64.8359	(38)
Heat transfer coeff	136.7616	136.6373	136.5155	135.9435	135.8365	135.3382	135.3382	135.2460	135.5301	135.8365	136.0530	136.2793	(39)
Average = Sum(39)m / 12 =												135.9430	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9082	0.9073	0.9065	0.9027	0.9020	0.8987	0.8987	0.8981	0.9000	0.9020	0.9035	0.9050	(40)
HLP (average)												0.9027	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9351 (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	84.7098	83.4517	81.6801	78.4136	75.9677	73.2555	71.7905	73.5497	75.4652	78.3673	81.7011	84.4234	(42b)
Hot water usage for other uses	44.6884	43.0634	41.4383	39.8133	38.1883	36.5632	36.5632	38.1883	39.8133	41.4383	43.0634	44.6884	(42c)
Average daily hot water use (litres/day)												119.1652	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.3982	126.5151	123.1185	118.2269	114.1559	109.8187	108.3538	111.7380	115.2785	119.8057	124.7645	129.1118	(44)
Energy conte	204.9351	180.1558	189.2285	161.8467	153.6758	135.0350	131.0445	138.3550	142.1499	162.5752	177.7499	202.1579	(45)
Energy content (annual)										Total = Sum(45)m =		1978.9095	
Distribution loss (46)m = 0.15 x (45)m	30.7403	27.0234	28.3843	24.2770	23.0514	20.2552	19.6567	20.7533	21.3225	24.3863	26.6625	30.3237	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	255.8940	226.1832	240.1874	211.1618	204.6347	184.3500	182.0034	189.3139	191.4650	213.5341	227.0650	253.1168	(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	255.8940	226.1832	240.1874	211.1618	204.6347	184.3500	182.0034	189.3139	191.4650	213.5341	227.0650	253.1168	(64)
									Total per year (kWh/year) = Sum(64)m =			2578.9095	(64)
12Total per year (kWh/year)												2579	(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	80.8807	71.4087	75.6582	66.1428	63.8369	57.2279	56.3120	58.7428	59.5936	66.7960	71.4306	79.9572	(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	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	171.7521	190.1541	171.7521	177.4772	171.7521	177.4772	171.7521	171.7521	177.4772	171.7521	177.4772	171.7521	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	321.1636	324.4963	316.0981	298.2193	275.6504	254.4389	240.2683	236.9357	245.3339	263.2127	285.7815	306.9931	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	(71)
Water heating gains (Table 5)	108.7106	106.2629	101.6911	91.8650	85.8023	79.4832	75.6882	78.9553	82.7689	89.7795	99.2092	107.4694	(72)
Total internal gains	671.6529	690.9399	659.5679	637.5880	603.2314	578.4258	554.7352	554.6697	572.6066	594.7709	632.4945	656.2411	(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	
Southeast	8.4100	36.7938	0.5400	0.7000	0.7700	81.0580	(77)
Northwest	13.8600	11.2829	0.5400	0.7000	0.7700	40.9648	(81)

Solar gains	122.0228	221.4568	339.1491	480.8021	593.8329	613.8608	581.7055	493.6610	387.6175	254.5018	148.6331	102.8227	(83)
Total gains	793.6757	912.3967	998.7170	1118.3901	1197.0643	1192.2866	1136.4407	1048.3307	960.2240	849.2728	781.1276	759.0638	(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	76.4662	76.5357	76.6040	76.9264	76.9870	77.2704	77.2704	77.3231	77.1610	76.9870	76.8645	76.7368	
alpha	6.0977	6.1024	6.1069	6.1284	6.1325	6.1514	6.1514	6.1549	6.1441	6.1325	6.1243	6.1158	
util living area													
	0.9990	0.9973	0.9923	0.9679	0.8818	0.6955	0.5193	0.5835	0.8484	0.9819	0.9974	0.9992	(86)
MIT	19.8897	20.0393	20.2638	20.5807	20.8452	20.9724	20.9960	20.9922	20.9101	20.5685	20.1712	19.8592	(87)
Th 2	20.1606	20.1613	20.1619	20.1652	20.1658	20.1686	20.1686	20.1691	20.1675	20.1658	20.1646	20.1633	(88)
util rest of house													
	0.9986	0.9964	0.9896	0.9560	0.8420	0.6177	0.4237	0.4833	0.7855	0.9732	0.9963	0.9990	(89)
MIT 2	18.8453	19.0372	19.3240	19.7231	20.0299	20.1522	20.1672	20.1661	20.1024	19.7134	19.2089	18.8083	(90)
Living area fraction										fLA = Living area / (4) =		0.2464	(91)
MIT	19.1026	19.2841	19.5555	19.9344	20.2307	20.3543	20.3714	20.3696	20.3014	19.9241	19.4460	19.0672	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.9526	19.1341	19.4055	19.7844	20.0807	20.2043	20.2214	20.2196	20.1514	19.7741	19.2960	18.9172	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9979	0.9947	0.9862	0.9492	0.8373	0.6212	0.4299	0.4895	0.7841	0.9676	0.9947	0.9984	(94)
Useful gains	791.9832	907.5967	984.9650	1061.5430	1002.3015	740.6912	488.5297	513.2079	752.9577	821.7276	777.0112	757.8237	(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													
	2003.9076	1944.9086	1761.8020	1479.6570	1138.4081	758.4708	490.1127	516.5916	820.1458	1246.1726	1659.3023	2005.6516	(97)
Space heating kWh													
	901.6717	697.0736	577.9667	301.0421	101.2633	0.0000	0.0000	0.0000	0.0000	315.7871	635.2496	928.3840	(98a)
Space heating requirement - total per year (kWh/year)												4458.4381	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	901.6717	697.0736	577.9667	301.0421	101.2633	0.0000	0.0000	0.0000	0.0000	315.7871	635.2496	928.3840	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4458.4381	
Space heating per m2											(98c) / (4) =	29.6065	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.5000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	901.6717	697.0736	577.9667	301.0421	101.2633	0.0000	0.0000	0.0000	0.0000	315.7871	635.2496	928.3840	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	1007.4544	778.8532	645.7729	336.3599	113.1434	0.0000	0.0000	0.0000	0.0000	352.8347	709.7761	1037.3005	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	255.8940	226.1832	240.1874	211.1618	204.6347	184.3500	182.0034	189.3139	191.4650	213.5341	227.0650	253.1168	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	285.9151	252.7187	268.3658	235.9350	228.6422	205.9777	203.3558	211.5239	213.9274	238.5855	253.7039	282.8121	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	33.7288	27.0585	24.3632	17.8495	13.7875	11.2645	12.5774	16.3486	21.2352	27.8617	31.4697	34.6662	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4981.4951	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2881.4631	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	272.2106	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)

Total delivered energy for all uses 8221.1688 (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	4981.4951	0.2100	1046.1140	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2881.4631	0.2100	605.1073	(264)
Space and water heating			1651.2212	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	272.2106	0.1443	39.2884	(268)
Total CO2, kg/year			1702.4389	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.3100	(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	4981.4951	1.1300	5629.0895	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2881.4631	1.1300	3256.0533	(278)
Space and water heating			8885.1428	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	272.2106	1.5338	417.5257	(282)
Total Primary energy kWh/year			9432.7693	(286)
Dwelling Primary energy Rate (DPER)			62.6400	(287)

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

CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.8800 (1b)	x	2.5000 (2b)	=	162.2000	(1b) - (3b)
First floor	46.5500 (1c)	x	2.5000 (2c)	=	116.3750	(1c) - (3c)
Second floor	39.1600 (1d)	x	2.5000 (2d)	=	97.9000	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.5900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	376.4750	(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	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1062	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3562	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2761	(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	0.3520	0.3451	0.3382	0.3037	0.2968	0.2623	0.2623	0.2554	0.2761	0.2968	0.3106	0.3244	(22b)
Effective ac	0.5620	0.5596	0.5572	0.5461	0.5440	0.5344	0.5344	0.5326	0.5381	0.5440	0.5482	0.5526	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			22.2700	1.1450	25.5000			(27)
Heatloss Floor 1			64.8800	0.1300	8.4344			(28a)
External Wall 1	165.1300	19.8400	145.2900	0.1800	26.1522			(29a)
Low Level Walls inc Dormers	15.3100	2.4300	12.8800	0.1800	2.3184			(29a)
Flat Roof	64.8800		64.8800	0.1100	7.1368			(30)
Total net area of external elements Aum(A, m2)			310.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		69.5418			(33)
Party Wall 1			87.9300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total	
	E5 Ground floor (normal)	24.6200	0.1600	3.9392	
	E2 Other lintels (including other steel lintels)	14.5800	0.0500	0.7290	
	E3 Sill	9.6800	0.0500	0.4840	
	E4 Jamb	25.2000	0.0500	1.2600	
	E6 Intermediate floor within a dwelling	41.4300	0.0000	0.0000	
	E18 Party wall between dwellings	15.0000	0.0600	0.9000	
	P1 Party wall - Ground floor	13.2300	0.0800	1.0584	
	P2 Party wall - Intermediate floor within a dwelling	21.9400	0.0000	0.0000	
	E16 Corner (normal)	27.5000	0.0900	2.4750	
	E14 Flat roof	31.5700	0.0800	2.5256	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.3712 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 82.9130 (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	69.8159	69.5170	69.2240	67.8479	67.5904	66.3918	66.3918	66.1699	66.8535	67.5904	68.1113	68.6558	(38)
Heat transfer coeff	152.7289	152.4300	152.1370	150.7609	150.5034	149.3048	149.3048	149.0829	149.7665	150.5034	151.0243	151.5688	(39)
Average = Sum(39)m / 12 =												150.7596	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0142	1.0122	1.0103	1.0011	0.9994	0.9915	0.9915	0.9900	0.9945	0.9994	1.0029	1.0065	(40)
HLP (average)												1.0011	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9351 (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

84.7098	83.4517	81.6801	78.4136	75.9677	73.2555	71.7905	73.5497	75.4652	78.3673	81.7011	84.4234	(42b)

Hot water usage for other uses

44.6884	43.0634	41.4383	39.8133	38.1883	36.5632	36.5632	38.1883	39.8133	41.4383	43.0634	44.6884	(42c)

Average daily hot water use (litres/day) 119.1652 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.3982	126.5151	123.1185	118.2269	114.1559	109.8187	108.3538	111.7380	115.2785	119.8057	124.7645	129.1118	(44)
Energy conte	204.9351	180.1558	189.2285	161.8467	153.6758	135.0350	131.0445	138.3550	142.1499	162.5752	177.7499	202.1579	(45)
Energy content (annual)										Total = Sum(45)m =		1978.9095	
Distribution loss (46)m = 0.15 x (45)m	30.7403	27.0234	28.3843	24.2770	23.0514	20.2552	19.6567	20.7533	21.3225	24.3863	26.6625	30.3237	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	255.8940	226.1832	240.1874	211.1618	204.6347	184.3500	182.0034	189.3139	191.4650	213.5341	227.0650	253.1168	(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	255.8940	226.1832	240.1874	211.1618	204.6347	184.3500	182.0034	189.3139	191.4650	213.5341	227.0650	253.1168	(64)
									Total per year (kWh/year) = Sum(64)m =			2578.9095	(64)
12Total per year (kWh/year)												2579	(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	80.8807	71.4087	75.6582	66.1428	63.8369	57.2279	56.3120	58.7428	59.5936	66.7960	71.4306	79.9572	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	171.7521	190.1541	171.7521	177.4772	171.7521	177.4772	171.7521	171.7521	177.4772	171.7521	177.4772	171.7521	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	321.1636	324.4963	316.0981	298.2193	275.6504	254.4389	240.2683	236.9357	245.3339	263.2127	285.7815	306.9931	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	(71)
Water heating gains (Table 5)	108.7106	106.2629	101.6911	91.8650	85.8023	79.4832	75.6882	78.9553	82.7689	89.7795	99.2092	107.4694	(72)
Total internal gains	671.6529	690.9399	659.5679	637.5880	603.2314	578.4258	554.7352	554.6697	572.6066	594.7709	632.4945	656.2411	(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	
Southeast	8.4100	36.7938	0.6300	0.7000	0.7700	94.5677	(77)
Northwest	13.8600	11.2829	0.6300	0.7000	0.7700	47.7922	(81)

Solar gains	142.3599	258.3663	395.6740	560.9357	692.8050	716.1709	678.6564	575.9379	452.2204	296.9188	173.4053	119.9598	(83)

Total gains	814.0128	949.3062	1055.2419	1198.5237	1296.0365	1294.5968	1233.3916	1130.6075	1024.8270	891.6897	805.8998	776.2009	(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, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.4719	68.6062	68.7383	69.3657	69.4844	70.0422	70.0422	70.1465	69.8263	69.4844	69.2448	68.9960	
alpha	5.5648	5.5737	5.5826	5.6244	5.6323	5.6695	5.6695	5.6764	5.6551	5.6323	5.6163	5.5997	
util living area													
	0.9988	0.9969	0.9914	0.9656	0.8799	0.6983	0.5255	0.5921	0.8533	0.9815	0.9971	0.9991	(86)
MIT	19.7318	19.8991	20.1528	20.5120	20.8102	20.9622	20.9936	20.9880	20.8836	20.4949	20.0523	19.7056	(87)
Th 2	20.0715	20.0732	20.0748	20.0824	20.0838	20.0905	20.0905	20.0917	20.0879	20.0838	20.0809	20.0779	(88)
util rest of house													
	0.9984	0.9959	0.9883	0.9526	0.8376	0.6149	0.4207	0.4826	0.7877	0.9723	0.9960	0.9988	(89)
MIT 2	18.5767	18.7919	19.1166	19.5715	19.9183	20.0682	20.0883	20.0872	20.0038	19.5575	18.9943	18.5478	(90)
Living area fraction										fLA = Living area / (4) =		0.2464	(91)
MIT	18.8612	19.0647	19.3719	19.8032	20.1380	20.2884	20.3113	20.3091	20.2205	19.7884	19.2549	18.8331	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8612	19.0647	19.3719	19.8032	20.1380	20.2884	20.3113	20.3091	20.2205	19.7884	19.2549	18.8331	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9976	0.9942	0.9851	0.9477	0.8405	0.6340	0.4466	0.5096	0.7986	0.9683	0.9945	0.9982	(94)
Useful gains	812.0883	943.8272	1039.5524	1135.8710	1089.2625	820.8286	550.8346	576.1382	818.3924	863.3997	801.4415	774.7883	(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													
	2223.9227	2159.1238	1958.2921	1643.7798	1269.9546	849.3129	554.1194	582.7811	916.6478	1382.8917	1835.6900	2217.9143	(97)
Space heating kWh													
	1050.4048	816.6793	683.5424	365.6943	134.4349	0.0000	0.0000	0.0000	0.0000	386.5020	744.6589	1073.6857	(98a)
Space heating requirement - total per year (kWh/year)												5255.6024	
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													
	1050.4048	816.6793	683.5424	365.6943	134.4349	0.0000	0.0000	0.0000	0.0000	386.5020	744.6589	1073.6857	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5255.6024	
Space heating per m2											(98c) / (4) =	34.9001	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1050.4048	816.6793	683.5424	365.6943	134.4349	0.0000	0.0000	0.0000	0.0000	386.5020	744.6589	1073.6857	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	1136.8017	883.8521	739.7645	395.7731	145.4923	0.0000	0.0000	0.0000	0.0000	418.2922	805.9079	1161.9975	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	255.8940	226.1832	240.1874	211.1618	204.6347	184.3500	182.0034	189.3139	191.4650	213.5341	227.0650	253.1168	(64)
Efficiency of water heater												80.3000	(216)
(217)m	87.0732	86.8819	86.4914	85.5462	83.5027	80.3000	80.3000	80.3000	80.3000	85.6362	86.7295	87.1200	(217)
Fuel for water heating, kWh/month													
	293.8837	260.3342	277.7009	246.8394	245.0635	229.5766	226.6543	235.7583	238.4371	249.3504	261.8082	290.5381	(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	35.6867	28.6292	25.7774	18.8856	14.5878	11.9184	13.3075	17.2976	22.4678	29.4790	33.2965	36.6785	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-58.6901	-81.7215	-115.9867	-128.6384	-137.1302	-127.3076	-125.6129	-119.2931	-108.0010	-92.5006	-64.1119	-50.8513	(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	-36.3070	-76.0047	-150.4359	-225.0893	-296.8745	-298.1321	-294.7374	-249.9896	-183.7374	-108.5416	-48.4132	-28.7487	(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												5687.8814	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												3055.9447	(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)												288.0121	(232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3206.8566	(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	5910.9816	(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	5687.8814	0.2100	1194.4551	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3055.9447	0.2100	641.7484	(264)
Space and water heating			1836.2035	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	288.0121	0.1443	41.5690	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1209.8453	0.1349	-163.1910	
PV Unit electricity exported	-1997.0113	0.1260	-251.6209	
Total			-414.8119	(269)
Total CO2, kg/year			1474.8899	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.7900	(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	5687.8814	1.1300	6427.3060	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3055.9447	1.1300	3453.2175	(278)
Space and water heating			9880.5235	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	288.0121	1.5338	441.7625	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1209.8453	1.4985	-1812.9921	
PV Unit electricity exported	-1997.0113	0.4625	-923.6292	
Total			-2736.6213	(283)
Total Primary energy kWh/year			7715.7655	(286)
Target Primary Energy Rate (TPER)			51.2400	(287)

Full SAP Calculation Printout

Property Reference	Grosvenor 4BH MID 177 - Lean	**Issued on Date**	13/03/2024
Assessment Reference	Grosvenor 4BH MID 177 Lean	**Prop Type Ref**	4BH MID 177 - Be Lean
Property	Grosvenor Garages, Fitzgerald Avenue, East Sheen, London, SW14 8SZ		

SAP Rating	89 B	**DER**	9.30	**TER**	7.61
Environmental	90 B	**% DER < TER**			-22.21
CO_2 Emissions (t/year)	1.39	**DFEE**	26.75	**TFEE**	28.75
Compliance Check	See BREL	**% DFEE < TFEE**			6.95
% DPER < TPER	-30.54	**DPER**	51.71	**TPER**	39.61

Assessor Details	Mr. Ivan Ball	**Assessor ID**	X001-7283
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.5000	(1b)	x 2.5000	(2b) =	156.2500	(1b) - (3b)
First floor	62.5000	(1c)	x 2.5000	(2c) =	156.2500	(1c) - (3c)
Second floor	54.1000	(1d)	x 2.5000	(2d) =	135.2500	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	179.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		447.7500	(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	5 * 10 =	50.0000	(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) =	50.0000 / (5) =	0.1117	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2617	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2028	(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	0.2586	0.2535	0.2484	0.2231	0.2180	0.1927	0.1927	0.1876	0.2028	0.2180	0.2281	0.2383	(22b)
Effective ac	0.5334	0.5321	0.5309	0.5249	0.5238	0.5186	0.5186	0.5176	0.5206	0.5238	0.5260	0.5284	(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	
Opening Type 1 (Uw = 1.20)			22.5800	1.1450	25.8550			(27)
Heatloss Floor 1			62.5000	0.1100	6.8750			(28a)
External Wall 1	82.8000	22.5800	60.2200	0.1500	9.0330			(29a)
Flat Roof	62.5000		62.5000	0.1200	7.5000			(30)
Total net area of external elements Aum(A, m2)			207.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	49.2630			(33)
Party Wall 1			191.0800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E5	Ground floor (normal)	9.6300	0.0460	0.4430
E2	Other lintels (including other steel lintels)	13.4600	0.0280	0.3769
E3	Sill	8.5600	0.0240	0.2054
E4	Jamb	30.6000	0.0190	0.5814
E6	Intermediate floor within a dwelling	23.4900	0.0000	0.0000
E18	Party wall between dwellings	30.0000	0.0410	1.2300
P1	Party wall - Ground floor	26.9900	0.1600	4.3184

P2 Party wall - Intermediate floor within a dwelling	49.4400	0.0000	0.0000	
E16 Corner (normal)	20.0000	0.0370	0.7400	
E14 Flat roof	13.8600	0.0410	0.5683	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.4634 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 57.7263 (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	78.8179	78.6261	78.4381	77.5551	77.3899	76.6208	76.6208	76.4784	76.9170	77.3899	77.7241	78.0735	(38)
Heat transfer coeff	136.5442	136.3524	136.1644	135.2814	135.1162	134.3471	134.3471	134.2047	134.6434	135.1162	135.4504	135.7998	(39)
Average = Sum(39)m / 12 =												135.2806	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7624	0.7613	0.7603	0.7553	0.7544	0.7501	0.7501	0.7493	0.7518	0.7544	0.7563	0.7582	(40)
HLP (average)												0.7553	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9746 (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

85.4771	84.2076	82.4200	79.1239	76.6558	73.9190	72.4408	74.2160	76.1488	79.0772	82.4412	85.1881	(42b)

Hot water usage for other uses

45.0932	43.4534	41.8137	40.1739	38.5342	36.8944	36.8944	38.5342	40.1739	41.8137	43.4534	45.0932	(42c)

Average daily hot water use (litres/day) 120.2446 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.5703	127.6611	124.2337	119.2978	115.1900	110.8135	109.3352	112.7501	116.3227	120.8909	125.8946	130.2813	(44)
Energy conte	206.7914	181.7877	190.9425	163.3127	155.0678	136.2581	132.2315	139.6082	143.4375	164.0478	179.3600	203.9891	(45)
Energy content (annual)										Total = Sum(45)m =		1996.8344	
Distribution loss (46)m = 0.15 x (45)m	31.0187	27.2682	28.6414	24.4969	23.2602	20.4387	19.8347	20.9412	21.5156	24.6072	26.9040	30.5984	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	257.7503	227.8151	241.9015	212.6278	206.0267	185.5732	183.1904	190.5671	192.7526	215.0067	228.6750	254.9480	(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	257.7503	227.8151	241.9015	212.6278	206.0267	185.5732	183.1904	190.5671	192.7526	215.0067	228.6750	254.9480	(64)
										Total per year (kWh/year) = Sum(64)m =		2596.8344	(64)
12Total per year (kWh/year)												2597	(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	81.4979	71.9513	76.2281	66.6303	64.2998	57.6346	56.7067	59.1595	60.0217	67.2856	71.9660	80.5661	(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	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	194.2123	215.0207	194.2123	200.6860	194.2123	200.6860	194.2123	194.2123	200.6860	194.2123	200.6860	194.2123	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	350.7205	354.3599	345.1887	325.6645	301.0187	277.8550	262.3803	258.7409	267.9121	287.4363	312.0821	335.2458	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	(71)
Water heating gains (Table 5)	109.5402	107.0703	102.4572	92.5420	86.4244	80.0480	76.2187	79.5154	83.3635	90.4376	99.9527	108.2878	(72)
Total internal gains	725.0924	747.0704	712.4776	689.5120	652.2748	626.2086	600.4307	600.0881	619.5811	642.7057	683.3403	708.3653	(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	
Southeast	8.4100	36.7938	0.5400	0.7000	0.7700	81.0580	(77)
Northwest	14.1700	11.2829	0.5400	0.7000	0.7700	41.8810	(81)

Solar gains	122.9390	223.3218	342.5093	486.3205	601.2507	621.7690	589.1034	499.5587	391.7119	256.7811	149.7860	103.5709	(83)
Total gains	848.0314	970.3922	1054.9869	1175.8325	1253.5255	1247.9775	1189.5342	1099.6468	1011.2930	899.4867	833.1263	811.9362	(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	91.0877	91.2159	91.3418	91.9380	92.0504	92.5773	92.5773	92.6756	92.3737	92.0504	91.8233	91.5870

alpha	7.0725	7.0811	7.0895	7.1292	7.1367	7.1718	7.1718	7.1784	7.1582	7.1367	7.1216	7.1058	
util living area	0.9994	0.9983	0.9945	0.9714	0.8782	0.6734	0.4953	0.5575	0.8372	0.9847	0.9983	0.9996	(86)
MIT	20.0773	20.2099	20.4039	20.6810	20.8995	20.9875	20.9987	20.9972	20.9468	20.6649	20.3223	20.0527	(87)
Th 2	20.2860	20.2870	20.2879	20.2922	20.2930	20.2968	20.2968	20.2975	20.2953	20.2930	20.2914	20.2897	(88)
util rest of house	0.9992	0.9977	0.9926	0.9613	0.8410	0.6060	0.4171	0.4745	0.7789	0.9775	0.9977	0.9994	(89)
MIT 2	19.1825	19.3531	19.6015	19.9522	20.2046	20.2893	20.2963	20.2964	20.2568	19.9368	19.5008	19.1537	(90)
Living area fraction										fLA = Living area / (4) =		0.1921	(91)
MIT	19.3544	19.5177	19.7556	20.0922	20.3381	20.4234	20.4312	20.4310	20.3894	20.0766	19.6586	19.3264	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.2044	19.3677	19.6056	19.9422	20.1881	20.2734	20.2812	20.2810	20.2394	19.9266	19.5086	19.1764	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9988	0.9966	0.9900	0.9549	0.8348	0.6037	0.4153	0.4725	0.7737	0.9724	0.9966	0.9991	(94)
Useful gains	847.0178	967.1374	1044.4513	1122.8250	1046.4176	753.4049	494.0278	519.5591	782.4546	874.6836	830.2800	811.2204	(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	2035.1048	1972.7004	1784.5192	1493.8017	1146.8744	762.2020	494.5618	520.8451	826.6237	1260.1767	1680.7442	2033.7920	(97)
Space heating kWh	883.9367	675.7383	550.6105	267.1032	74.7399	0.0000	0.0000	0.0000	0.0000	286.8068	612.3342	909.5933	(98a)
Space heating requirement - total per year (kWh/year)												4260.8629	
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	883.9367	675.7383	550.6105	267.1032	74.7399	0.0000	0.0000	0.0000	0.0000	286.8068	612.3342	909.5933	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4260.8629	
Space heating per m2											(98c) / (4) =	23.7904	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	89.5000	(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	883.9367	675.7383	550.6105	267.1032	74.7399	0.0000	0.0000	0.0000	0.0000	286.8068	612.3342	909.5933	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	987.6388	755.0149	615.2072	298.4393	83.5082	0.0000	0.0000	0.0000	0.0000	320.4546	684.1723	1016.3053	(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	257.7503	227.8151	241.9015	212.6278	206.0267	185.5732	183.1904	190.5671	192.7526	215.0067	228.6750	254.9480	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	287.9892	254.5420	270.2810	237.5730	230.1975	207.3443	204.6820	212.9242	215.3660	240.2309	255.5028	284.8581	(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	38.1395	30.5969	27.5492	20.1837	15.5905	12.7375	14.2221	18.4865	24.0121	31.5052	35.5850	39.1995	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4760.7406	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2901.4910	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	307.8078	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	8056.0394	(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	4760.7406	0.2100	999.7555	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2901.4910	0.2100	609.3131	(264)
Space and water heating			1609.0686	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	307.8078	0.1443	44.4262	(268)
Total CO2, kg/year			1665.4241	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.3000	(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	4760.7406	1.1300	5379.6369	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2901.4910	1.1300	3278.6848	(278)
Space and water heating			8658.3217	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	307.8078	1.5338	472.1259	(282)
Total Primary energy kWh/year			9260.5484	(286)
Dwelling Primary energy Rate (DPER)			51.7100	(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	62.5000 (1b)	x	2.5000 (2b)	=	156.2500 (1b) - (3b)	
First floor	62.5000 (1c)	x	2.5000 (2c)	=	156.2500 (1c) - (3c)	
Second floor	54.1000 (1d)	x	2.5000 (2d)	=	135.2500 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	179.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	447.7500	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0893	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3393	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2630	(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	0.3353	0.3287	0.3222	0.2893	0.2827	0.2498	0.2498	0.2433	0.2630	0.2827	0.2959	0.3090	(22b)
Effective ac	0.5562	0.5540	0.5519	0.5418	0.5400	0.5312	0.5312	0.5296	0.5346	0.5400	0.5438	0.5477	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			22.5800	1.1450	25.8550			(27)
Heatloss Floor 1			62.5000	0.1300	8.1250			(28a)
External Wall 1	82.8000	22.5800	60.2200	0.1800	10.8396			(29a)
Flat Roof	62.5000		62.5000	0.1100	6.8750			(30)
Total net area of external elements Aum(A, m2)			207.8000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.6946			(33)
Party Wall 1			191.0800	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	9.6300	0.1600	1.5408
E2 Other lintels (including other steel lintels)	13.4600	0.0500	0.6730
E3 Sill	8.5600	0.0500	0.4280
E4 Jamb	30.6000	0.0500	1.5300
E6 Intermediate floor within a dwelling	23.4900	0.0000	0.0000
E18 Party wall between dwellings	30.0000	0.0600	1.8000
P1 Party wall - Ground floor	26.9900	0.0800	2.1592
P2 Party wall - Intermediate floor within a dwelling	49.4400	0.0000	0.0000
E16 Corner (normal)	20.0000	0.0900	1.8000
E14 Flat roof	13.8600	0.0800	1.1088

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.0398 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 62.7344 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	82.1849	81.8624	81.5463	80.0613	79.7835	78.4901	78.4901	78.2506	78.9883	79.7835	80.3455	80.9331	(38)
Heat transfer coeff	144.9193	144.5968	144.2806	142.7957	142.5178	141.2245	141.2245	140.9850	141.7227	142.5178	143.0799	143.6675	(39)

Average = Sum(39)m / 12 = 142.7943

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8092	0.8074	0.8056	0.7973	0.7957	0.7885	0.7885	0.7872	0.7913	0.7957	0.7989	0.8022	(40)
HLP (average)												0.7973	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9746 (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

85.4771	84.2076	82.4200	79.1239	76.6558	73.9190	72.4408	74.2160	76.1488	79.0772	82.4412	85.1881	(42b)

Hot water usage for other uses

45.0932	43.4534	41.8137	40.1739	38.5342	36.8944	36.8944	38.5342	40.1739	41.8137	43.4534	45.0932	(42c)

Average daily hot water use (litres/day) 120.2446 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.5703	127.6611	124.2337	119.2978	115.1900	110.8135	109.3352	112.7501	116.3227	120.8909	125.8946	130.2813	(44)
Energy conte	206.7914	181.7877	190.9425	163.3127	155.0678	136.2581	132.2315	139.6082	143.4375	164.0478	179.3600	203.9891	(45)

Energy content (annual) Total = Sum(45)m = 1996.8344

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

31.0187	27.2682	28.6414	24.4969	23.2602	20.4387	19.8347	20.9412	21.5156	24.6072	26.9040	30.5984	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

257.7503	227.8151	241.9015	212.6278	206.0267	185.5732	183.1904	190.5671	192.7526	215.0067	228.6750	254.9480	(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

257.7503	227.8151	241.9015	212.6278	206.0267	185.5732	183.1904	190.5671	192.7526	215.0067	228.6750	254.9480	(64)

Total per year (kWh/year) = Sum(64)m = 2596.8344 (64)

12Total per year (kWh/year) 2597 (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

81.4979	71.9513	76.2281	66.6303	64.2998	57.6346	56.7067	59.1595	60.0217	67.2856	71.9660	80.5661	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	194.2123	215.0207	194.2123	200.6860	194.2123	200.6860	194.2123	194.2123	200.6860	194.2123	200.6860	194.2123	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	350.7205	354.3599	345.1887	325.6645	301.0187	277.8550	262.3803	258.7409	267.9121	287.4363	312.0821	335.2458	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	(71)
Water heating gains (Table 5)	109.5402	107.0703	102.4572	92.5420	86.4244	80.0480	76.2187	79.5154	83.3635	90.4376	99.9527	108.2878	(72)
Total internal gains	725.0924	747.0704	712.4776	689.5120	652.2748	626.2086	600.4307	600.0881	619.5811	642.7057	683.3403	708.3653	(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	
Southeast	8.4100	36.7938	0.6300	0.7000	0.7700	94.5677	(77)
Northwest	14.1700	11.2829	0.6300	0.7000	0.7700	48.8612	(81)

Solar gains	143.4289	260.5421	399.5942	567.3739	701.4591	725.3971	687.2874	582.8185	456.9973	299.5779	174.7503	120.8328	(83)
Total gains	868.5213	1007.6125	1112.0718	1256.8859	1353.7340	1351.6057	1287.7181	1182.9066	1076.5783	942.2836	858.0907	829.1980	(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, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	85.8236	86.0151	86.2035	87.1000	87.2698	88.0690	88.0690	88.2186	87.7594	87.2698	86.9270	86.5714	
alpha	6.7216	6.7343	6.7469	6.8067	6.8180	6.8713	6.8713	6.8812	6.8506	6.8180	6.7951	6.7714	
util living area													
	0.9993	0.9980	0.9934	0.9659	0.8627	0.6541	0.4809	0.5443	0.8270	0.9829	0.9981	0.9995	(86)
MIT	20.0095	20.1558	20.3695	20.6714	20.8992	20.9874	20.9986	20.9970	20.9439	20.6443	20.2760	19.9873	(87)
Th 2	20.2454	20.2470	20.2485	20.2557	20.2570	20.2633	20.2633	20.2645	20.2609	20.2570	20.2543	20.2515	(88)
util rest of house													
	0.9991	0.9973	0.9910	0.9540	0.8223	0.5851	0.4013	0.4594	0.7658	0.9749	0.9974	0.9994	(89)
MIT 2	19.0638	19.2523	19.5261	19.9089	20.1697	20.2559	20.2628	20.2633	20.2209	19.8813	19.4122	19.0400	(90)
Living area fraction									fLA = Living area / (4) =			0.1921	(91)
MIT	19.2454	19.4259	19.6881	20.0554	20.3098	20.3964	20.4041	20.4042	20.3597	20.0278	19.5781	19.2220	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2454	19.4259	19.6881	20.0554	20.3098	20.3964	20.4041	20.4042	20.3597	20.0278	19.5781	19.2220	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9987	0.9963	0.9887	0.9501	0.8255	0.5979	0.4166	0.4757	0.7747	0.9716	0.9964	0.9991	(94)
Useful gains	867.4016	1003.8739	1099.5456	1194.1677	1117.4413	808.0955	536.4653	562.7105	834.0741	915.5677	855.0126	828.4122	(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													
	2165.8776	2100.3937	1902.7901	1592.9380	1227.0529	818.5904	537.2370	564.5327	887.1471	1343.6309	1785.3702	2158.1681	(97)
Space heating kWh													
	966.0661	736.8613	597.6139	287.1146	81.5510	0.0000	0.0000	0.0000	0.0000	318.4790	669.8575	989.3384	(98a)
Space heating requirement - total per year (kWh/year)												4646.8818	
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													
	966.0661	736.8613	597.6139	287.1146	81.5510	0.0000	0.0000	0.0000	0.0000	318.4790	669.8575	989.3384	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4646.8818	
Space heating per m2											(98c) / (4) =	25.9457	(99)

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

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

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

Efficiency of main space heating system 1 (in %) 92.4000 (206)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	966.0661	736.8613	597.6139	287.1146	81.5510	0.0000	0.0000	0.0000	0.0000	318.4790	669.8575	989.3384	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	1045.5261	797.4689	646.7683	310.7301	88.2587	0.0000	0.0000	0.0000	0.0000	344.6742	724.9540	1070.7125	(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													
	257.7503	227.8151	241.9015	212.6278	206.0267	185.5732	183.1904	190.5671	192.7526	215.0067	228.6750	254.9480	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.9390	86.7070	86.2387	85.0256	82.5650	80.3000	80.3000	80.3000	80.3000	85.2216	86.5412	86.9911	(217)
Fuel for water heating, kWh/month													
	296.4727	262.7413	280.5022	250.0751	249.5328	231.0998	228.1325	237.3190	240.0406	252.2913	264.2383	293.0737	(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	40.3535	32.3731	29.1483	21.3553	16.4955	13.4769	15.0477	19.5596	25.4060	33.3340	37.6507	41.4750	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-58.2258	-81.9427	-117.5124	-131.7095	-141.5337	-131.7768	-130.0228	-122.9414	-110.4484	-93.4003	-63.9143	-50.3460	(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	-33.2865	-69.9976	-139.1370	-209.0423	-276.5503	-278.0565	-274.9077	-232.7949	-170.5881	-100.2670	-44.4829	-26.3340	(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												5029.0928	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												3085.5194	(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)												325.6756	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3089.2191	(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	5437.0688	(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	5029.0928	0.2100	1056.1095	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3085.5194	0.2100	647.9591	(264)
Space and water heating			1704.0686	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	325.6756	0.1443	47.0051	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1233.7743	0.1347	-166.1478	
PV Unit electricity exported	-1855.4448	0.1259	-233.5535	
Total			-399.7013	(269)
Total CO2, kg/year			1363.3016	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.6100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	5029.0928	1.1300	5682.8749	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3085.5194	1.1300	3486.6369	(278)
Space and water heating			9169.5118	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	325.6756	1.5338	499.5322	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1233.7743	1.4977	-1847.8342	
PV Unit electricity exported	-1855.4448	0.4620	-857.2980	
Total			-2705.1322	(283)
Total Primary energy kWh/year			7094.0126	(286)
Target Primary Energy Rate (TPER)			39.6100	(287)

Appendix 2 – BRUKL Output Document for the Commercial Unit for the Be Lean scenario

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Grosvenor Garage - Be Lean

As designed

Date: Thu Mar 14 08:21:48 2024

Administrative information

Building Details

Address: Grosvenor Garage, Fitzgerald Avenue, LONDON, SW14 8SZ

Certifier details

Name: Paul Goddard

Telephone number: 07967339102

Address: 15 Withins Road, Warrington, WA3 4JW

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.2.0

BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 35.66

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	4.93	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	3.7	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	52.74	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	39.58	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.15	0.15	Level 0 - Staff room_W_8
Floors	0.18	0.11	0.11	Level 0 - Staff room_S_3
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	-	-	No heat loss flat roofs
Windows** and roof windows	1.6	1.2	1.2	Level 0 - Office_G_6
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.2	1.2	Level 0 - Office_D_7
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m^2K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	3.5

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- Project HVAC

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

1- Project DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	2.86	0.01
Standard value	2*	N/A

* Standard shown is for all types except absorption and gas engine heat pumps.

Zone-level mechanical ventilation, exhaust, and terminal units

ID	**System type in the Approved Documents**
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

Zone name	**SFP [W/(l/s)]**									**HR efficiency**	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	**Zone**	**Standard**
Level 0 - Staff room	0.3	-	-	-	-	-	-	-	-	-	N/A
Level 0 - WC	0.3	-	-	-	-	-	-	-	-	-	N/A
Level 0 - WC	0.3	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	**General luminaire**	**Display light source**	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
Level 0 - Staff room	115	-	-
Level 0 - Office	115	-	-
Level 0 - WC	115	-	-
Level 0 - Office	115	-	-
Level 0 - Lobby	115	-	-
Level 0 - WC	115	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Level 0 - Staff room	N/A	N/A
Level 0 - Office	NO (-57.2%)	NO
Level 0 - Office	NO (-80.8%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	107.1	107.1
External area [m^2]	196.7	196.7
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	4	3
Average conductance [W/K]	37.82	77.27
Average U-value [W/m^2K]	0.19	0.39
Alpha value* [%]	12.55	23.89

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
100	**Offices and Workshop Businesses**
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	6.19	8.31
Cooling	0	0
Auxiliary	3.33	10.95
Lighting	10.95	7.13
Hot water	6.09	8.98
Equipment*	41.92	41.92
TOTAL**	**26.56**	**35.37**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	121.03	168.35
Primary energy [kWh_{PE}/m^2]	39.58	52.74
Total emissions [kg/m^2]	3.7	4.93

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: convectors, [HS] ASHP, [HFT] Electricity, [CFT] Natural Gas										
	Actual	55.2	65.8	6.2	0	3.3	2.48	0	2.64	0
	Notional	79	89.3	8.3	0	3.3	2.64	0	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Appendix 3 – DER Worksheets for the Modelled Units for the Be Green scenario

Full SAP Calculation Printout

Property Reference	Grosvenor 1BF GND 51 - Green	**Issued on Date**	14/03/2024
Assessment Reference	Grosvenor 1BF GND 51 Green	**Prop Type Ref**	1BF GND 51 - Be Green
Property	Grosvenor Garage, Fitzgerald Avenue, East Sheen, London, SW14 8SZ		

SAP Rating	81 B	**DER**	5.84	**TER**	14.67
Environmental	96 A	**% DER < TER**			60.19
CO_2 Emissions (t/year)	0.24	**DFEE**	28.69	**TFEE**	35.49
Compliance Check	See BREL	**% DFEE < TFEE**			19.17
% DPER < TPER	21.61	**DPER**	60.85	**TPER**	77.63

Assessor Details	Mr. Ivan Ball	**Assessor ID**	X001-7283
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.0000	(1b)	x 2.5000	(2b) =	127.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		127.5000	(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	1 * 10 =	10.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	10.0000 / (5) =	0.0784 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2284 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1770 (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	0.2257	0.2213	0.2169	0.1947	0.1903	0.1682	0.1682	0.1638	0.1770	0.1903	0.1992	0.2080	(22b)
Effective ac	0.5255	0.5245	0.5235	0.5190	0.5181	0.5141	0.5141	0.5134	0.5157	0.5181	0.5198	0.5216	(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	
Glazed Door/ Window (Uw = 1.20)			10.5400	1.1450	12.0687			(27)
Heatloss Floor 1			51.0000	0.1100	5.6100			(28a)
External Wall 1	47.9300	10.5400	37.3900	0.1500	5.6085			(29a)
Total net area of external elements Aum(A, m2)			98.9300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.2872			(33)
Party Wall			33.4300	0.0000	0.0000			(32)
Party Ceiling			51.0000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.0000	0.0280	0.1680
E3 Sill	3.3000	0.0240	0.0792
E4 Jamb	17.1000	0.0190	0.3249
E16 Corner (normal)	7.5000	0.0370	0.2775
E18 Party wall between dwellings	5.0000	0.0410	0.2050
E5 Ground floor (normal)	19.1700	0.0460	0.8818

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	1.9364	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	25.2236	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.1093	22.0677	22.0269	21.8353	21.7994	21.6326	21.6326	21.6016	21.6968	21.7994	21.8720	21.9478	(38)
Heat transfer coeff	47.3330	47.2913	47.2505	47.0589	47.0231	46.8562	46.8562	46.8253	46.9205	47.0231	47.0956	47.1714	(39)
Average = Sum(39)m / 12 =												47.0588	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9281	0.9273	0.9265	0.9227	0.9220	0.9187	0.9187	0.9181	0.9200	0.9220	0.9234	0.9249	(40)
HLP (average)												0.9227	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7196 (42)

	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	61.1133	60.2056	58.9275	56.5709	54.8063	52.8496	51.7927	53.0619	54.4438	56.5375	58.9427	60.9067	(42b)
Hot water usage for other uses	32.2401	31.0678	29.8954	28.7230	27.5507	26.3783	26.3783	27.5507	28.7230	29.8954	31.0678	32.2401	(42c)
Average daily hot water use (litres/day)												85.9708	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.3534	91.2734	88.8229	85.2939	82.3570	79.2279	78.1710	80.6126	83.1668	86.4329	90.0104	93.1468	(44)
Energy conte	147.8489	129.9721	136.5175	116.7631	110.8683	97.4200	94.5411	99.8152	102.5530	117.2886	128.2364	145.8454	(45)
Energy content (annual)										Total = Sum(45)m =		1427.6696	
Distribution loss (46)m = 0.15 x (45)m	22.1773	19.4958	20.4776	17.5145	16.6302	14.6130	14.1812	14.9723	15.3830	17.5933	19.2355	21.8768	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.9360	(55)
Total storage loss	29.0160	26.2080	29.0160	28.0800	29.0160	28.0800	29.0160	29.0160	28.0800	29.0160	28.0800	29.0160	(56)
If cylinder contains dedicated solar storage	29.0160	26.2080	29.0160	28.0800	29.0160	28.0800	29.0160	29.0160	28.0800	29.0160	28.0800	29.0160	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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	231.7225	205.7289	220.3911	197.9311	194.7419	148.0120	146.8195	152.0936	153.1450	201.1622	209.4044	229.7190	(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	-2.1666	-4.9675	-10.8438	-17.7589	-24.6517	-25.8721	-25.4369	-20.7095	-14.2236	-7.3701	-2.9657	-1.6696	(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	229.5559	200.7614	209.5474	180.1722	170.0902	122.1399	121.3826	131.3842	138.9214	193.7922	206.4386	228.0493	(64)
									Total per year (kWh/year) = Sum(64)m =			2132.2353	(64)
12Total per year (kWh/year)												2132	(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	93.0459	82.8548	89.2782	81.2941	80.7498	50.4017	50.0448	51.7985	52.1085	82.8846	85.1090	92.3797	(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	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	75.8721	84.0012	75.8721	78.4012	75.8721	78.4012	75.8721	75.8721	78.4012	75.8721	78.4012	75.8721	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.8308	151.3856	147.4676	139.1267	128.5978	118.7021	112.0911	110.5364	114.4543	122.7953	133.3242	143.2199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	(71)
Water heating gains (Table 5)	125.0616	123.2958	119.9975	112.9085	108.5347	70.0024	67.2646	69.6216	72.3729	111.4040	118.2069	124.1662	(72)
Total internal gains	402.5581	410.4762	395.1308	382.2299	364.7981	315.8992	304.0213	304.8236	314.0219	361.8649	381.7258	395.0517	(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	6.0800	11.2829	0.5400	0.7000	0.7700	17.9701	(75)
East	4.4600	19.6403	0.5400	0.7000	0.7700	22.9460	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	40.9161	81.4660	139.8261	216.0441	277.6129	290.3588	273.8647	226.2827	166.2795	97.9646	51.2220	33.5450	(83)
Total gains	443.4742	491.9421	534.9569	598.2741	642.4109	606.2580	577.8860	531.1063	480.3014	459.8295	432.9479	428.5967	(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	74.8245	74.8904	74.9550	75.2603	75.3176	75.5859	75.5859	75.6358	75.4823	75.3176	75.2016	75.0808	
alpha	5.9883	5.9927	5.9970	6.0174	6.0212	6.0391	6.0391	6.0424	6.0322	6.0212	6.0134	6.0054	
util living area													

	0.9860	0.9729	0.9396	0.8354	0.6577	0.4911	0.3563	0.4045	0.6524	0.8826	0.9702	0.9884	(86)
MIT	20.2263	20.3805	20.6001	20.8474	20.9676	20.9952	20.9994	20.9988	20.9771	20.8175	20.4857	20.1916	(87)
Th 2	20.1437	20.1444	20.1450	20.1482	20.1488	20.1516	20.1516	20.1521	20.1505	20.1488	20.1476	20.1464	(88)
util rest of house													
	0.9820	0.9655	0.9238	0.8001	0.6049	0.4276	0.2879	0.3305	0.5807	0.8472	0.9607	0.9850	(89)
MIT 2	19.2598	19.4529	19.7217	20.0057	20.1244	20.1491	20.1514	20.1517	20.1365	19.9815	19.5890	19.2182	(90)
Living area fraction										fLA = Living area / (4) =		0.6118	(91)
MIT	19.8511	20.0204	20.2591	20.5206	20.6402	20.6667	20.6702	20.6699	20.6508	20.4930	20.1376	19.8137	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7011	19.8704	20.1091	20.3706	20.4902	20.5167	20.5202	20.5199	20.5008	20.3430	19.9876	19.6637	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9794	0.9626	0.9230	0.8099	0.6265	0.4551	0.3176	0.3627	0.6110	0.8560	0.9585	0.9827	(94)
Useful gains	434.3353	473.5584	493.7670	484.5296	402.4917	275.8949	183.5618	192.6458	293.4479	393.6113	414.9913	421.1648	(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	728.9795	707.9684	643.0379	539.7962	413.3434	277.2347	183.6854	192.9163	300.3266	458.1437	606.9472	729.4425	(97)
Space heating kWh	219.2153	157.5235	111.0575	39.7920	8.0736	0.0000	0.0000	0.0000	0.0000	48.0121	138.2082	229.3586	(98a)
Space heating requirement - total per year (kWh/year)												951.2408	
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	219.2153	157.5235	111.0575	39.7920	8.0736	0.0000	0.0000	0.0000	0.0000	48.0121	138.2082	229.3586	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												951.2408	
Space heating per m2											(98c) / (4) =	18.6518	(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	219.2153	157.5235	111.0575	39.7920	8.0736	0.0000	0.0000	0.0000	0.0000	48.0121	138.2082	229.3586	(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)	219.2153	157.5235	111.0575	39.7920	8.0736	0.0000	0.0000	0.0000	0.0000	48.0121	138.2082	229.3586	(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	229.5559	200.7614	209.5474	180.1722	170.0902	122.1399	121.3826	131.3842	138.9214	193.7922	206.4386	228.0493	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month	135.0329	118.0950	123.2632	105.9837	100.0531	71.8470	71.4015	77.2848	81.7185	113.9954	121.4345	134.1467	(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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	14.8998	11.9532	10.7625	7.8851	6.0907	4.9761	5.5561	7.2220	9.3807	12.3080	13.9019	15.3139	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.2404	-21.0505	-33.8417	-41.3313	-47.0324	-43.7665	-43.1659	-39.2792	-32.5107	-25.0778	-15.2131	-11.1621	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0204	-0.2201	-1.3203	-4.0045	-7.1512	-8.0820	-7.9412	-6.3357	-4.2313	-1.4414	-0.1758	0.0436	(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	951.2408 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	170.0000
Water heating fuel used	1254.2561 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
central heating pump	41.0000 (230c)
Total electricity for the above, kWh/year	41.0000 (231)
Electricity for lighting (calculated in Appendix L)	120.2500 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-407.5110 (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	1959.2358 (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	951.2408	0.1571	149.4682	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1254.2561	0.1427	179.0061	(264)
Space and water heating			328.4743	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	120.2500	0.1443	17.3558	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.6715	0.1330	-48.7588	
PV Unit electricity exported	-40.8395	0.1143	-4.6660	
Total			-53.4249	(269)
Total CO2, kg/year			298.0924	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.8400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	951.2408	1.5817	1504.5730	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1254.2561	1.5278	1916.2949	(278)
Space and water heating			3420.8679	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	120.2500	1.5338	184.4434	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.6715	1.4914	-546.8463	
PV Unit electricity exported	-40.8395	0.4188	-17.1039	
Total			-563.9502	(283)
Total Primary energy kWh/year			3103.3860	(286)
Dwelling Primary energy Rate (DPER)			60.8500	(287)

Full SAP Calculation Printout

Property Reference	Grosvenor 1BF MID 51 - Green	**Issued on Date**	14/03/2024
Assessment Reference	Grosvenor 1BF MID 51 Green	**Prop Type Ref**	1BF MID 51 - Be Green
Property	Grosvenor Garage, Fitzgerald Avenue, East Sheen, London, SW14 8SZ		

SAP Rating	85 B	**DER**	4.73	**TER**	12.46
Environmental	97 A	**% DER < TER**			62.04
CO_2 Emissions (t/year)	0.2	**DFEE**	20.82	**TFEE**	25.04
Compliance Check	See BREL	**% DFEE < TFEE**			16.84
% DPER < TPER	24.52	**DPER**	49.65	**TPER**	65.78

Assessor Details	Mr. Ivan Ball	**Assessor ID**	X001-7283
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.0000	(1b)	x 2.5000	(2b) =	127.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		127.5000	(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	1 * 10 =	10.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	10.0000 / (5) =	0.0784 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2284 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1770 (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	0.2257	0.2213	0.2169	0.1947	0.1903	0.1682	0.1682	0.1638	0.1770	0.1903	0.1992	0.2080	(22b)
Effective ac	0.5255	0.5245	0.5235	0.5190	0.5181	0.5141	0.5141	0.5134	0.5157	0.5181	0.5198	0.5216	(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	
Glazed Door/ Window (Uw = 1.20)			9.7100	1.1450	11.1183			(27)
External Wall 1	47.7500	9.7100	38.0400	0.1500	5.7060			(29a)
Total net area of external elements Aum(A, m2)			47.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.8243			(33)
Party Wall			38.3300	0.0000	0.0000			(32)
Party Floor 1			51.0000					(32d)
Party Ceiling			51.0000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.7500	0.0280	0.1610
E3 Sill	5.7500	0.0240	0.1380
E4 Jamb	15.3000	0.0190	0.2907
E16 Corner (normal)	12.5000	0.0370	0.4625
E18 Party wall between dwellings	5.0000	0.0410	0.2050
E7 Party floor between dwellings (in blocks of flats)	19.1000	0.0360	0.6876
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0790	-0.3950

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	1.5498	(36)
Point Thermal bridges	(36a) = 0.0000	

Total fabric heat loss (33) + (36) + (36a) = 18.3741 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.1093	22.0677	22.0269	21.8353	21.7994	21.6326	21.6326	21.6016	21.6968	21.7994	21.8720	21.9478	(38)
Heat transfer coeff	40.4835	40.4418	40.4010	40.2094	40.1736	40.0067	40.0067	39.9758	40.0710	40.1736	40.2461	40.3219	(39)

Average = Sum(39)m / 12 = 40.2092

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7938	0.7930	0.7922	0.7884	0.7877	0.7844	0.7844	0.7838	0.7857	0.7877	0.7891	0.7906	(40)
HLP (average)												0.7884	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7196 (42)

Hot water usage for mixer showers

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

61.1133	60.2056	58.9275	56.5709	54.8063	52.8496	51.7927	53.0619	54.4438	56.5375	58.9427	60.9067	(42b)

Hot water usage for other uses

32.2401	31.0678	29.8954	28.7230	27.5507	26.3783	26.3783	27.5507	28.7230	29.8954	31.0678	32.2401	(42c)

Average daily hot water use (litres/day) 85.9708 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.3534	91.2734	88.8229	85.2939	82.3570	79.2279	78.1710	80.6126	83.1668	86.4329	90.0104	93.1468	(44)
Energy conte	147.8489	129.9721	136.5175	116.7631	110.8683	97.4200	94.5411	99.8152	102.5530	117.2886	128.2364	145.8454	(45)

Energy content (annual) Total = Sum(45)m = 1427.6696

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

22.1773	19.4958	20.4776	17.5145	16.6302	14.6130	14.1812	14.9723	15.3830	17.5933	19.2355	21.8768	(46)

Water storage loss:

Store volume 200.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.2000 (48)

Temperature factor from Table 2b 0.7800 (49)

Enter (49) or (54) in (55) 0.9360 (55)

Total storage loss

29.0160	26.2080	29.0160	28.0800	29.0160	28.0800	29.0160	29.0160	28.0800	29.0160	28.0800	29.0160	(56)

If cylinder contains dedicated solar storage

29.0160	26.2080	29.0160	28.0800	29.0160	28.0800	29.0160	29.0160	28.0800	29.0160	28.0800	29.0160	(57)
Primary loss 54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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

231.7225	205.7289	220.3911	197.9311	194.7419	148.0120	146.8195	152.0936	153.1450	201.1622	209.4044	229.7190	(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 -2.1662	-4.9667	-10.8424	-17.7572	-24.6499	-25.8702	-25.4348	-20.7073	-14.2216	-7.3689	-2.9652	-1.6693	(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

229.5563	200.7622	209.5487	180.1739	170.0920	122.1417	121.3846	131.3863	138.9234	193.7934	206.4392	228.0496	(64)

Total per year (kWh/year) = Sum(64)m = 2132.2515 (64)

12Total per year (kWh/year) 2132 (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

93.0459	82.8548	89.2782	81.2941	80.7498	50.4017	50.0448	51.7985	52.1085	82.8846	85.1090	92.3797	(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	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.5526	84.7546	76.5526	79.1043	76.5526	79.1043	76.5526	76.5526	79.1043	76.5526	79.1043	76.5526	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.8308	151.3856	147.4676	139.1267	128.5978	118.7021	112.0911	110.5364	114.4543	122.7953	133.3242	143.2199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	(71)
Water heating gains (Table 5)	125.0616	123.2958	119.9975	112.9085	108.5347	70.0024	67.2646	69.6216	72.3729	111.4040	118.2069	124.1662	(72)
Total internal gains	403.2385	411.2295	395.8112	382.9331	365.4785	316.6023	304.7018	305.5041	314.7251	362.5453	382.4290	395.7322	(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	6.0600	11.2829	0.5400	0.7000	0.7700	17.9110	(75)
East	1.2200	19.6403	0.5400	0.7000	0.7700	6.2767	(76)
Southeast	2.4300	36.7938	0.5400	0.7000	0.7700	23.4210	(77)

Solar gains	47.6088	88.6317	140.4931	205.0015	256.9051	266.7988	252.3505	211.9974	162.6626	103.2167	58.4160	39.8322	(83)
Total gains	450.8473	499.8612	536.3044	587.9345	622.3836	583.4011	557.0523	517.5015	477.3877	465.7621	440.8450	435.5644	(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	87.4843	87.5743	87.6628	88.0805	88.1591	88.5269	88.5269	88.5953	88.3849	88.1591	88.0003	87.8348

alpha	6.8323	6.8383	6.8442	6.8720	6.8773	6.9018	6.9018	6.9064	6.8923	6.8773	6.8667	6.8557	
util living area	0.9782	0.9564	0.9076	0.7774	0.5930	0.4380	0.3159	0.3552	0.5734	0.8210	0.9512	0.9822	(86)
MIT	20.4716	20.6110	20.7772	20.9336	20.9898	20.9989	20.9999	20.9998	20.9938	20.9203	20.6848	20.4386	(87)
Th 2	20.2587	20.2594	20.2601	20.2634	20.2640	20.2668	20.2668	20.2674	20.2657	20.2640	20.2628	20.2615	(88)
util rest of house	0.9725	0.9460	0.8876	0.7416	0.5486	0.3883	0.2633	0.2987	0.5149	0.7815	0.9378	0.9774	(89)
MIT 2	19.6599	19.8316	20.0296	20.2031	20.2564	20.2662	20.2668	20.2673	20.2620	20.1939	19.9269	19.6210	(90)
Living area fraction										fLA = Living area / (4) =		0.6118	(91)
MIT	20.1565	20.3084	20.4870	20.6500	20.7050	20.7145	20.7153	20.7154	20.7097	20.6383	20.3906	20.1212	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.0065	20.1584	20.3370	20.5000	20.5550	20.5645	20.5653	20.5654	20.5597	20.4883	20.2406	19.9712	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9702	0.9443	0.8899	0.7535	0.5663	0.4085	0.2847	0.3217	0.5385	0.7941	0.9374	0.9752	(94)
Useful gains	437.4183	472.0418	477.2432	443.0049	352.4451	238.3230	158.6185	166.4705	257.0897	369.8661	413.2274	424.7621	(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	635.8529	617.0773	559.0293	466.4302	355.7386	238.6181	158.6380	166.5153	258.8477	397.2477	528.8581	635.9245	(97)
Space heating kWh	147.6353	97.4639	60.8488	16.8662	2.4504	0.0000	0.0000	0.0000	0.0000	20.3719	83.2541	157.1048	(98a)
Space heating requirement - total per year (kWh/year)												585.9955	
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	147.6353	97.4639	60.8488	16.8662	2.4504	0.0000	0.0000	0.0000	0.0000	20.3719	83.2541	157.1048	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												585.9955	
Space heating per m2											(98c) / (4) =	11.4901	(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	147.6353	97.4639	60.8488	16.8662	2.4504	0.0000	0.0000	0.0000	0.0000	20.3719	83.2541	157.1048	(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)	147.6353	97.4639	60.8488	16.8662	2.4504	0.0000	0.0000	0.0000	0.0000	20.3719	83.2541	157.1048	(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	229.5563	200.7622	209.5487	180.1739	170.0920	122.1417	121.3846	131.3863	138.9234	193.7934	206.4392	228.0496	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month	135.0331	118.0954	123.2640	105.9847	100.0541	71.8481	71.4027	77.2861	81.7197	113.9961	121.4348	134.1468	(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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	15.0334	12.0604	10.8590	7.9558	6.1453	5.0208	5.6059	7.2868	9.4648	12.4184	14.0265	15.4513	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.0812	-20.6756	-33.1097	-40.6181	-46.7623	-43.7693	-43.1690	-39.2824	-32.5136	-24.7096	-14.9922	-11.0396	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-0.1393	-0.5959	-2.0538	-4.7196	-7.4233	-8.0812	-7.9403	-6.3349	-4.2306	-1.8110	-0.3974	-0.0793	(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	585.9955 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	170.0000
Water heating fuel used	1254.2656 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
central heating pump	41.0000 (230c)
Total electricity for the above, kWh/year	41.0000 (231)
Electricity for lighting (calculated in Appendix L)	121.3285 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-407.5290 (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	1595.0605 (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	585.9955	0.1581	92.6540	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1254.2656	0.1427	179.0074	(264)
Space and water heating			271.6614	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	121.3285	0.1443	17.5114	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-363.7226	0.1329	-48.3213	
PV Unit electricity exported	-43.8064	0.1177	-5.1539	
Total			-53.4752	(269)
Total CO2, kg/year			241.3848	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.7300	(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	585.9955	1.5853	928.9771	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1254.2656	1.5278	1916.3090	(278)
Space and water heating			2845.2861	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	121.3285	1.5338	186.0976	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-363.7226	1.4909	-542.2762	
PV Unit electricity exported	-43.8064	0.4315	-18.9032	
Total			-561.1794	(283)
Total Primary energy kWh/year			2532.2291	(286)
Dwelling Primary energy Rate (DPER)			49.6500	(287)

Full SAP Calculation Printout

Property Reference	Grosvenor 1BF TOP 51 - Green	**Issued on Date**	14/03/2024
Assessment Reference	Grosvenor 1BF TOP 51 Green	**Prop Type Ref**	1BF TOP 51 - Be Green
Property	Grosvenor Garage, Fitzgerald Avenue, East Sheen, London, SW14 8SZ		

SAP Rating	81 B	**DER**	5.81	**TER**	14.11
Environmental	96 A	**% DER < TER**			58.82
CO_2 Emissions (t/year)	0.24	**DFEE**	28.21	**TFEE**	32.68
Compliance Check	See BREL	**% DFEE < TFEE**			13.67
% DPER < TPER	18.96	**DPER**	60.50	**TPER**	74.66

Assessor Details	Mr. Ivan Ball	**Assessor ID**	X001-7283
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	51.0000	(1b)	x 2.5000	(2b) =	127.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	127.5000	(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	1 * 10 =	10.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	10.0000 / (5) =	0.0784	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2284	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1770	(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	0.2257	0.2213	0.2169	0.1947	0.1903	0.1682	0.1682	0.1638	0.1770	0.1903	0.1992	0.2080	(22b)
Effective ac	0.5255	0.5245	0.5235	0.5190	0.5181	0.5141	0.5141	0.5134	0.5157	0.5181	0.5198	0.5216	(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	
Glazed Door/ Window (Uw = 1.20)			9.7100	1.1450	11.1183			(27)
External Wall 1	47.7500	9.7100	38.0400	0.1500	5.7060			(29a)
Flat Roof	51.0000		51.0000	0.1200	6.1200			(30)
Total net area of external elements Aum(A, m2)			98.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.9443			(33)
Party Wall			38.3300	0.0000	0.0000			(32)
Party Floor 1			51.0000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.7500	0.0280	0.1610
E3 Sill	5.7500	0.0240	0.1380
E4 Jamb	15.3000	0.0190	0.2907
E16 Corner (normal)	12.5000	0.0370	0.4625
E18 Party wall between dwellings	5.0000	0.0410	0.2050
E7 Party floor between dwellings (in blocks of flats)	19.1000	0.0360	0.6876
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0790	-0.3950
E14 Flat roof	19.1000	0.0410	0.7831
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			2.3329 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.2772 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.1093	22.0677	22.0269	21.8353	21.7994	21.6326	21.6326	21.6016	21.6968	21.7994	21.8720	21.9478	(38)
Heat transfer coeff	47.3866	47.3449	47.3041	47.1125	47.0767	46.9098	46.9098	46.8789	46.9741	47.0767	47.1492	47.2250	(39)
Average = Sum(39)m / 12 =												47.1123	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9291	0.9283	0.9275	0.9238	0.9231	0.9198	0.9198	0.9192	0.9211	0.9231	0.9245	0.9260	(40)
HLP (average)												0.9238	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7196 (42)
Hot water usage for mixer showers

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

61.1133	60.2056	58.9275	56.5709	54.8063	52.8496	51.7927	53.0619	54.4438	56.5375	58.9427	60.9067	(42b)

Hot water usage for other uses

32.2401	31.0678	29.8954	28.7230	27.5507	26.3783	26.3783	27.5507	28.7230	29.8954	31.0678	32.2401	(42c)

Average daily hot water use (litres/day) 85.9708 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.3534	91.2734	88.8229	85.2939	82.3570	79.2279	78.1710	80.6126	83.1668	86.4329	90.0104	93.1468	(44)
Energy conte	147.8489	129.9721	136.5175	116.7631	110.8683	97.4200	94.5411	99.8152	102.5530	117.2886	128.2364	145.8454	(45)
Energy content (annual)										Total = Sum(45)m =		1427.6696	
Distribution loss (46)m = 0.15 x (45)m	22.1773	19.4958	20.4776	17.5145	16.6302	14.6130	14.1812	14.9723	15.3830	17.5933	19.2355	21.8768	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.9360	(55)
Total storage loss	29.0160	26.2080	29.0160	28.0800	29.0160	28.0800	29.0160	29.0160	28.0800	29.0160	28.0800	29.0160	(56)
If cylinder contains dedicated solar storage	29.0160	26.2080	29.0160	28.0800	29.0160	28.0800	29.0160	29.0160	28.0800	29.0160	28.0800	29.0160	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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	231.7225	205.7289	220.3911	197.9311	194.7419	148.0120	146.8195	152.0936	153.1450	201.1622	209.4044	229.7190	(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	-2.1662	-4.9667	-10.8424	-17.7572	-24.6499	-25.8702	-25.4348	-20.7073	-14.2216	-7.3689	-2.9652	-1.6693	(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	229.5563	200.7622	209.5487	180.1739	170.0920	122.1417	121.3846	131.3863	138.9234	193.7934	206.4392	228.0496	(64)
										Total per year (kWh/year) = Sum(64)m =		2132.2515	(64)
12Total per year (kWh/year)												2132	(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	93.0459	82.8548	89.2782	81.2941	80.7498	50.4017	50.0448	51.7985	52.1085	82.8846	85.1090	92.3797	(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	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	85.9785	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.5526	84.7546	76.5526	79.1043	76.5526	79.1043	76.5526	76.5526	79.1043	76.5526	79.1043	76.5526	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.8308	151.3856	147.4676	139.1267	128.5978	118.7021	112.0911	110.5364	114.4543	122.7953	133.3242	143.2199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	31.5979	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	-68.7828	(71)
Water heating gains (Table 5)	125.0616	123.2958	119.9975	112.9085	108.5347	70.0024	67.2646	69.6216	72.3729	111.4040	118.2069	124.1662	(72)
Total internal gains	403.2385	411.2295	395.8112	382.9331	365.4785	316.6023	304.7018	305.5041	314.7251	362.5453	382.4290	395.7322	(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	6.0600	11.2829	0.5400	0.7000	0.7700	17.9110	(75)
East	1.2200	19.6403	0.5400	0.7000	0.7700	6.2767	(76)
Southeast	2.4300	36.7938	0.5400	0.7000	0.7700	23.4210	(77)

Solar gains	47.6088	88.6317	140.4931	205.0015	256.9051	266.7988	252.3505	211.9974	162.6626	103.2167	58.4160	39.8322	(83)
Total gains	450.8473	499.8612	536.3044	587.9345	622.3836	583.4011	557.0523	517.5015	477.3877	465.7621	440.8450	435.5644	(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	74.7399	74.8056	74.8701	75.1746	75.2319	75.4995	75.4995	75.5493	75.3962	75.2319	75.1162	74.9956	
alpha	5.9827	5.9870	5.9913	6.0116	6.0155	6.0333	6.0333	6.0366	6.0264	6.0155	6.0077	5.9997	
util living area	0.9848	0.9710	0.9392	0.8438	0.6760	0.5100	0.3699	0.4155	0.6563	0.8779	0.9678	0.9875	(86)
MIT	20.2393	20.3935	20.6008	20.8379	20.9625	20.9941	20.9993	20.9986	20.9763	20.8231	20.4986	20.2039	(87)
Th 2	20.1428	20.1435	20.1442	20.1473	20.1479	20.1507	20.1507	20.1512	20.1496	20.1479	20.1467	20.1455	(88)
util rest of house	0.9805	0.9631	0.9232	0.8092	0.6227	0.4444	0.2989	0.3395	0.5844	0.8418	0.9576	0.9839	(89)
MIT 2	19.2754	19.4681	19.7217	19.9951	20.1194	20.1476	20.1505	20.1507	20.1350	19.9864	19.6039	19.2330	(90)
Living area fraction										fLA = Living area / (4) =		0.6118	(91)
MIT	19.8651	20.0342	20.2595	20.5107	20.6352	20.6655	20.6697	20.6694	20.6497	20.4982	20.1513	19.8270	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7151	19.8842	20.1095	20.3607	20.4852	20.5155	20.5197	20.5194	20.4997	20.3482	20.0013	19.6770	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9779	0.9602	0.9225	0.8184	0.6443	0.4728	0.3298	0.3726	0.6148	0.8510	0.9556	0.9814	(94)
Useful gains	440.8840	479.9898	494.7432	481.1840	400.9907	275.8407	183.7209	192.7985	293.4865	396.3777	421.2526	427.4644	(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	730.4684	709.4262	643.7853	539.9417	413.5773	277.4934	183.8745	193.1140	300.6200	458.9151	608.2844	730.9020	(97)
Space heating kWh	215.4508	154.1813	110.8873	42.3056	9.3645	0.0000	0.0000	0.0000	0.0000	46.5278	134.6629	225.7576	(98a)
Space heating requirement - total per year (kWh/year)												939.1378	
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	215.4508	154.1813	110.8873	42.3056	9.3645	0.0000	0.0000	0.0000	0.0000	46.5278	134.6629	225.7576	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												939.1378	
Space heating per m2										(98c) / (4) =		18.4145	(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	215.4508	154.1813	110.8873	42.3056	9.3645	0.0000	0.0000	0.0000	0.0000	46.5278	134.6629	225.7576	(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)	215.4508	154.1813	110.8873	42.3056	9.3645	0.0000	0.0000	0.0000	0.0000	46.5278	134.6629	225.7576	(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	229.5563	200.7622	209.5487	180.1739	170.0920	122.1417	121.3846	131.3863	138.9234	193.7934	206.4392	228.0496	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month	135.0331	118.0954	123.2640	105.9847	100.0541	71.8481	71.4027	77.2861	81.7197	113.9961	121.4348	134.1468	(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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	15.0334	12.0604	10.8590	7.9558	6.1453	5.0208	5.6059	7.2868	9.4648	12.4184	14.0265	15.4513	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.2330	-21.0321	-33.8407	-41.4079	-47.0967	-43.7693	-43.1690	-39.2824	-32.5136	-25.0605	-15.2005	-11.1568	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0126	-0.2394	-1.3228	-3.9298	-7.0889	-8.0812	-7.9403	-6.3349	-4.2306	-1.4601	-0.1890	0.0379	(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												939.1378	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												170.0000	
Water heating fuel used												1254.2656	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												121.3285	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-407.5290	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1948.2029	(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	939.1378	0.1571	147.4994	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1254.2656	0.1427	179.0074	(264)
Space and water heating			326.5068	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	121.3285	0.1443	17.5114	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.7624	0.1330	-48.7702	
PV Unit electricity exported	-40.7666	0.1143	-4.6578	
Total			-53.4281	(269)
Total CO2, kg/year			296.2774	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.8100	(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	939.1378	1.5814	1485.1847	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1254.2656	1.5278	1916.3090	(278)
Space and water heating			3401.4937	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	121.3285	1.5338	186.0976	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.7624	1.4914	-546.9793	
PV Unit electricity exported	-40.7666	0.4188	-17.0732	
Total			-564.0524	(283)
Total Primary energy kWh/year			3085.5637	(286)
Dwelling Primary energy Rate (DPER)			60.5000	(287)

Full SAP Calculation Printout

Property Reference	Grosvenor 2BF MID 99 - Green	**Issued on Date**	14/03/2024
Assessment Reference	Grosvenor 2BF MID 99 Green	**Prop Type Ref**	2BF MID 99 - Be Green
Property	Grosvenor Garage, Fitzgerald Avenue, East Sheen, London, SW14 8SZ		

SAP Rating	87 B	**DER**	3.16	**TER**	7.98
Environmental	97 A	**% DER < TER**			60.40
CO_2 Emissions (t/year)	0.24	**DFEE**	16.98	**TFEE**	19.71
Compliance Check	See BREL	**% DFEE < TFEE**			13.85
% DPER < TPER	20.56	**DPER**	32.89	**TPER**	41.40

Assessor Details	Mr. Ivan Ball	**Assessor ID**	X001-7283
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	99.0000	(1b)	x 2.5000	(2b) =	247.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		247.5000	(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) =	0.0808 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2308 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1789 (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	0.2281	0.2236	0.2191	0.1968	0.1923	0.1699	0.1699	0.1655	0.1789	0.1923	0.2012	0.2102	(22b)
Effective ac	0.5260	0.5250	0.5240	0.5194	0.5185	0.5144	0.5144	0.5137	0.5160	0.5185	0.5202	0.5221	(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	
Glazed Door/ Window (Uw = 1.20)			14.0800	1.1450	16.1221			(27)
External Wall 1	75.0000	14.0800	60.9200	0.1500	9.1380			(29a)
Total net area of external elements Aum(A, m2)			75.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.2601			(33)
Party Wall			33.8200	0.0000	0.0000			(32)
Party Floor 1			99.0000					(32d)
Party Ceiling			99.0000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.3300	0.0280	0.2332
E3 Sill	8.3300	0.0240	0.1999
E4 Jamb	18.0000	0.0190	0.3420
E16 Corner (normal)	10.0000	0.0370	0.3700
E18 Party wall between dwellings	5.0000	0.0410	0.2050
E7 Party floor between dwellings (in blocks of flats)	30.0000	0.0360	1.0800
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0790	-0.3950

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	2.0352	(36)
Point Thermal bridges	(36a) = 0.0000	

Total fabric heat loss (33) + (36) + (36a) = 27.2953 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	42.9616	42.8792	42.7983	42.4186	42.3475	42.0168	42.0168	41.9555	42.1442	42.3475	42.4912	42.6415	(38)
Heat transfer coeff	70.2569	70.1745	70.0936	69.7139	69.6428	69.3121	69.3121	69.2508	69.4395	69.6428	69.7865	69.9368	(39)
Average = Sum(39)m / 12 =												69.7135	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7097	0.7088	0.7080	0.7042	0.7035	0.7001	0.7001	0.6995	0.7014	0.7035	0.7049	0.7064	(40)
HLP (average)												0.7042	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7301 (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

80.7296	79.5307	77.8423	74.7293	72.3982	69.8135	68.4174	70.0939	71.9194	74.6852	77.8623	80.4567	(42b)

Hot water usage for other uses

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

Average daily hot water use (litres/day) 113.5661 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.3183	120.5707	117.3336	112.6719	108.7922	104.6588	103.2627	106.4879	109.8621	114.1765	118.9023	123.0454	(44)
Energy conte	195.3061	171.6911	180.3374	154.2422	146.4552	128.6902	124.8872	131.8543	135.4709	154.9364	169.3982	192.6594	(45)
Energy content (annual)										Total = Sum(45)m =		1885.9285	
Distribution loss (46)m = 0.15 x (45)m	29.2959	25.7537	27.0506	23.1363	21.9683	19.3035	18.7331	19.7781	20.3206	23.2405	25.4097	28.8989	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.9360	(55)
Total storage loss	29.0160	26.2080	29.0160	28.0800	29.0160	28.0800	29.0160	29.0160	28.0800	29.0160	28.0800	29.0160	(56)
If cylinder contains dedicated solar storage	29.0160	26.2080	29.0160	28.0800	29.0160	28.0800	29.0160	29.0160	28.0800	29.0160	28.0800	29.0160	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	279.1797	247.4479	264.2110	235.4102	230.3288	179.2822	177.1656	184.1327	186.0629	238.8100	250.5662	276.5330	(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	-4.7702	-10.8717	-23.6196	-38.5063	-53.3485	-55.4861	-54.6085	-44.5967	-30.7255	-16.1569	-6.5326	-3.6851	(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	274.4095	236.5761	240.5914	196.9039	176.9803	123.7961	122.5571	139.5359	155.3374	222.6531	244.0335	272.8479	(64)
										Total per year (kWh/year) = Sum(64)m =		2406.2223	(64)
12Total per year (kWh/year)												2406	(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	108.8253	96.7263	103.8483	93.7559	92.5824	60.7991	60.1349	62.4515	63.0537	95.4024	98.7953	107.9453	(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	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	137.3519	152.0682	137.3519	141.9303	137.3519	141.9303	137.3519	137.3519	141.9303	137.3519	141.9303	137.3519	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)
Water heating gains (Table 5)	146.2706	143.9380	139.5810	130.2166	124.4388	84.4432	80.8265	83.9401	87.5745	128.2291	137.2157	145.0878	(72)
Total internal gains	605.2746	620.3012	594.5677	575.6027	547.3482	492.1091	472.6759	473.1466	488.0196	541.2747	572.7380	592.8537	(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	
Southeast	12.2600	36.7938	0.5400	0.7000	0.7700	118.1655	(77)
Northwest	1.8200	11.2829	0.5400	0.7000	0.7700	5.3792	(81)

Solar gains	123.5447	212.2290	295.1270	373.6316	425.7594	425.8743	409.2592	369.8812	322.2377	235.8379	148.3034	105.5179	(83)
Total gains	728.8193	832.5302	889.6947	949.2343	973.1076	917.9834	881.9351	843.0278	810.2573	777.1126	721.0415	698.3716	(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	97.8551	97.9701	98.0831	98.6174	98.7180	99.1891	99.1891	99.2768	99.0071	98.7180	98.5147	98.3030
alpha	7.5237	7.5313	7.5389	7.5745	7.5812	7.6126	7.6126	7.6185	7.6005	7.5812	7.5676	7.5535

util living area													
	0.9893	0.9715	0.9327	0.8251	0.6551	0.4822	0.3457	0.3777	0.5868	0.8501	0.9705	0.9919	(86)
MIT	20.4676	20.6220	20.7804	20.9289	20.9880	20.9989	20.9999	20.9999	20.9957	20.9249	20.6815	20.4320	(87)
Th 2	20.3323	20.3330	20.3338	20.3371	20.3378	20.3407	20.3407	20.3413	20.3396	20.3378	20.3365	20.3352	(88)
util rest of house													
	0.9863	0.9643	0.9172	0.7937	0.6119	0.4330	0.2940	0.3237	0.5326	0.8153	0.9618	0.9897	(89)
MIT 2	19.7167	19.9097	20.1016	20.2708	20.3286	20.3401	20.3407	20.3412	20.3370	20.2703	19.9883	19.6742	(90)
Living area fraction									fLA = Living area / (4) =			0.3152	(91)
MIT	19.9533	20.1342	20.3155	20.4782	20.5364	20.5478	20.5485	20.5488	20.5446	20.4766	20.2068	19.9130	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.8033	19.9842	20.1655	20.3282	20.3864	20.3978	20.3985	20.3988	20.3946	20.3266	20.0568	19.7630	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9834	0.9598	0.9128	0.7933	0.6151	0.4373	0.2985	0.3284	0.5372	0.8146	0.9573	0.9872	(94)
Useful gains	716.6903	799.0964	812.0858	753.0069	598.6066	401.4346	263.2603	276.8810	435.2344	633.0597	690.2811	689.4051	(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													
	1089.2168	1058.5266	957.8644	796.7021	604.9439	401.8546	263.2789	276.9196	437.0909	677.3886	904.2102	1088.4266	(97)
Space heating kWh													
	277.1597	174.3371	108.4593	31.4606	4.7149	0.0000	0.0000	0.0000	0.0000	32.9807	154.0290	296.8720	(98a)
Space heating requirement - total per year (kWh/year)												1080.0133	
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													
	277.1597	174.3371	108.4593	31.4606	4.7149	0.0000	0.0000	0.0000	0.0000	32.9807	154.0290	296.8720	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1080.0133	
Space heating per m2											(98c) / (4) =	10.9092	(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													
	277.1597	174.3371	108.4593	31.4606	4.7149	0.0000	0.0000	0.0000	0.0000	32.9807	154.0290	296.8720	(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)													
	277.1597	174.3371	108.4593	31.4606	4.7149	0.0000	0.0000	0.0000	0.0000	32.9807	154.0290	296.8720	(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													
	274.4095	236.5761	240.5914	196.9039	176.9803	123.7961	122.5571	139.5359	155.3374	222.6531	244.0335	272.8479	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month													
	161.4174	139.1624	141.5244	115.8258	104.1061	72.8212	72.0924	82.0800	91.3749	130.9724	143.5491	160.4988	(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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	26.9733	21.6389	19.4835	14.2744	11.0260	9.0083	10.0583	13.0741	16.9820	22.2813	25.1667	27.7229	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.9175	-38.8658	-61.1952	-73.2439	-82.4212	-76.6892	-75.5785	-69.4957	-58.4669	-45.4407	-28.3154	-21.0763	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-0.1178	-1.0587	-4.2049	-10.2796	-16.6529	-18.1091	-17.8169	-14.1664	-9.3948	-3.9820	-0.6954	-0.0133	(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												1080.0133	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												170.0000	
Water heating fuel used												1415.4249	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												217.6896	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-752.1980	(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												2001.9298	(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	1080.0133	0.1583	170.9204	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1415.4249	0.1436	203.2663	(264)
Space and water heating			374.1867	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	217.6896	0.1443	31.4193	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-655.7063	0.1333	-87.3958	
PV Unit electricity exported	-96.4918	0.1167	-11.2604	
Total			-98.6562	(269)
Total CO2, kg/year			312.6370	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.1600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1080.0133	1.5858	1712.7016	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1415.4249	1.5312	2167.2448	(278)
Space and water heating			3879.9465	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	217.6896	1.5338	333.8996	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-655.7063	1.4925	-978.6639	
PV Unit electricity exported	-96.4918	0.4280	-41.2973	
Total			-1019.9612	(283)
Total Primary energy kWh/year			3255.9097	(286)
Dwelling Primary energy Rate (DPER)			32.8900	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Grosvenor 2BF Top 76 - Green	**Issued on Date**	14/03/2024
Assessment Reference	Grosvenor 2BF TOP 76 Green	**Prop Type Ref**	2BF TOP 76 - Be Green
Property	Grosvenor Garage, Fitzgerald Avenue, East Sheen, London, SW14 8SZ		

SAP Rating	82 B	**DER**	4.64	**TER**	11.58
Environmental	96 A	**% DER < TER**			59.93
CO_2 Emissions (t/year)	0.28	**DFEE**	24.26	**TFEE**	29.60
Compliance Check	See BREL	**% DFEE < TFEE**			18.05
% DPER < TPER	20.95	**DPER**	48.21	**TPER**	60.99

Assessor Details	Mr. Ivan Ball	**Assessor ID**	X001-7283
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	76.0000	(1b)	x 2.5000	(2b) =	190.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	190.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	1 * 10 =	10.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	10.0000 / (5) =	0.0526	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2026	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1570	(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	0.2002	0.1963	0.1924	0.1727	0.1688	0.1492	0.1492	0.1453	0.1570	0.1688	0.1767	0.1845	(22b)
Effective ac	0.5200	0.5193	0.5185	0.5149	0.5142	0.5111	0.5111	0.5106	0.5123	0.5142	0.5156	0.5170	(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	
Glazed Door/ Window (Uw = 1.20)			7.0000	1.1450	8.0153			(27)
External Wall 1	76.9000	7.0000	69.9000	0.1500	10.4850			(29a)
Roof	76.0000		76.0000	0.1200	9.1200			(30)
Total net area of external elements Aum(A, m2)			152.9000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.6203			(33)
Party Wall			24.5300	0.0000	0.0000			(32)
Party Floor 1			76.0000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.1800	0.0280	0.1450
E3 Sill	5.1800	0.0240	0.1243
E4 Jamb	16.2000	0.0190	0.3078
E16 Corner (normal)	35.0000	0.0370	1.2950
E18 Party wall between dwellings	5.0000	0.0410	0.2050
E7 Party floor between dwellings (in blocks of flats)	30.7600	0.0360	1.1074
E17 Corner (inverted - internal area greater than external area)	30.0000	-0.0790	-2.3700
E14 Flat roof	30.7600	0.0410	1.2612
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			2.0757 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 29.6959 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.6068	32.5580	32.5102	32.2855	32.2435	32.0478	32.0478	32.0115	32.1231	32.2435	32.3285	32.4174	(38)
Heat transfer coeff	62.3028	62.2540	62.2061	61.9814	61.9394	61.7437	61.7437	61.7075	61.8191	61.9394	62.0244	62.1134	(39)
Average = Sum(39)m / 12 =												61.9812	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8198	0.8191	0.8185	0.8155	0.8150	0.8124	0.8124	0.8119	0.8134	0.8150	0.8161	0.8173	(40)
HLP (average)												0.8155	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3826 (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

73.9840	72.8853	71.3380	68.4851	66.3488	63.9801	62.7006	64.2370	65.9100	68.4446	71.3563	73.7339	(42b)

Hot water usage for other uses

39.0301	37.6108	36.1915	34.7722	33.3530	31.9337	31.9337	33.3530	34.7722	36.1915	37.6108	39.0301	(42c)

Average daily hot water use (litres/day) 104.0768 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.0141	110.4961	107.5295	103.2573	99.7018	95.9137	94.6343	97.5900	100.6822	104.6361	108.9671	112.7640	(44)
Energy conte	178.9867	157.3449	165.2688	141.3541	134.2178	117.9371	114.4519	120.8368	124.1513	141.9903	155.2436	176.5612	(45)
Energy content (annual)										Total = Sum(45)m =		1728.3446	
Distribution loss (46)m = 0.15 x (45)m	26.8480	23.6017	24.7903	21.2031	20.1327	17.6906	17.1678	18.1255	18.6227	21.2985	23.2865	26.4842	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.9360	(55)
Total storage loss	29.0160	26.2080	29.0160	28.0800	29.0160	28.0800	29.0160	29.0160	28.0800	29.0160	28.0800	29.0160	(56)
If cylinder contains dedicated solar storage	29.0160	26.2080	29.0160	28.0800	29.0160	28.0800	29.0160	29.0160	28.0800	29.0160	28.0800	29.0160	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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	262.8603	233.1017	249.1424	222.5221	218.0914	168.5291	166.7303	173.1152	174.7433	225.8639	236.4116	260.4348	(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	-3.4498	-7.8879	-17.1863	-28.0984	-38.9909	-40.6856	-40.0242	-32.6264	-22.4289	-11.7211	-4.7251	-2.6619	(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	259.4105	225.2139	231.9562	194.4237	179.1004	127.8435	126.7061	140.4888	152.3143	214.1428	231.6865	257.7729	(64)
										Total per year (kWh/year) = Sum(64)m =		2341.0595	(64)
12Total per year (kWh/year)												2341	(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	103.3992	91.9562	98.8380	89.4706	88.5135	57.2237	56.6652	58.7882	59.2899	91.0978	94.0889	102.5927	(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	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	119.1293	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.9231	138.3077	124.9231	129.0872	124.9231	129.0872	124.9231	124.9231	129.0872	124.9231	129.0872	124.9231	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	210.8782	213.0665	207.5522	195.8128	180.9940	167.0663	157.7618	155.5736	161.0879	172.8273	187.6461	201.5737	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	34.9129	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	-95.3035	(71)
Water heating gains (Table 5)	138.9774	136.8396	132.8467	124.2648	118.9697	79.4774	76.1629	79.0163	82.3471	122.4433	130.6790	137.8934	(72)
Total internal gains	536.5175	549.9527	527.0608	510.9036	486.6256	434.3697	417.5866	418.2518	431.2610	481.9325	509.1512	526.1290	(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	
Southeast	4.5700	36.7938	0.5400	0.7000	0.7700	44.0470	(77)
Northwest	2.4300	11.2829	0.5400	0.7000	0.7700	7.1821	(81)

Solar gains	51.2291	89.6478	128.9966	170.4542	200.6174	203.4309	194.3545	171.1995	143.2511	100.7884	61.7951	43.5603	(83)
Total gains	587.7467	639.6004	656.0574	681.3578	687.2430	637.8007	611.9412	589.4513	574.5121	582.7209	570.9463	569.6894	(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	84.7118	84.7782	84.8434	85.1509	85.2087	85.4788	85.4788	85.5290	85.3746	85.2087	85.0919	84.9701

alpha	6.6475	6.6519	6.6562	6.6767	6.6806	6.6986	6.6986	6.7019	6.6916	6.6806	6.6728	6.6647	
util living area	0.9901	0.9812	0.9641	0.9075	0.7820	0.6098	0.4429	0.4797	0.7135	0.9091	0.9775	0.9919	(86)
MIT	20.3119	20.4375	20.5955	20.8023	20.9420	20.9906	20.9990	20.9983	20.9750	20.8281	20.5433	20.2816	(87)
Th 2	20.2362	20.2368	20.2373	20.2399	20.2404	20.2426	20.2426	20.2430	20.2417	20.2404	20.2394	20.2384	(88)
util rest of house	0.9873	0.9759	0.9539	0.8828	0.7341	0.5419	0.3672	0.4018	0.6462	0.8802	0.9702	0.9895	(89)
MIT 2	19.4416	19.6001	19.7968	20.0446	20.1932	20.2372	20.2422	20.2424	20.2255	20.0780	19.7363	19.4051	(90)
Living area fraction										fLA = Living area / (4) =		0.4105	(91)
MIT	19.7989	19.9439	20.1247	20.3556	20.5006	20.5465	20.5529	20.5527	20.5332	20.3859	20.0676	19.7650	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6489	19.7939	19.9747	20.2056	20.3506	20.3965	20.4029	20.4027	20.3832	20.2359	19.9176	19.6150	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9845	0.9721	0.9498	0.8816	0.7414	0.5559	0.3833	0.4183	0.6593	0.8800	0.9664	0.9870	(94)
Useful gains	578.6166	621.7802	623.0993	600.6886	509.5437	354.5842	234.5697	246.5756	378.7803	512.7813	551.7650	562.3021	(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	956.2788	927.2029	838.2064	700.7399	535.8119	357.8982	234.8064	246.9980	388.4210	596.8446	795.0071	957.4752	(97)
Space heating kWh	280.9807	205.2440	160.0397	72.0370	19.5435	0.0000	0.0000	0.0000	0.0000	62.5431	175.1343	294.0088	(98a)
Space heating requirement - total per year (kWh/year)												1269.5311	
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	280.9807	205.2440	160.0397	72.0370	19.5435	0.0000	0.0000	0.0000	0.0000	62.5431	175.1343	294.0088	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1269.5311	
Space heating per m2										(98c) / (4) =		16.7044	(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	280.9807	205.2440	160.0397	72.0370	19.5435	0.0000	0.0000	0.0000	0.0000	62.5431	175.1343	294.0088	(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)	280.9807	205.2440	160.0397	72.0370	19.5435	0.0000	0.0000	0.0000	0.0000	62.5431	175.1343	294.0088	(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	259.4105	225.2139	231.9562	194.4237	179.1004	127.8435	126.7061	140.4888	152.3143	214.1428	231.6865	257.7729	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month	152.5944	132.4787	136.4448	114.3669	105.3532	75.2021	74.5330	82.6405	89.5967	125.9663	136.2862	151.6311	(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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	24.5325	19.6809	17.7204	12.9828	10.0283	8.1932	9.1481	11.8911	15.4453	20.2651	22.8894	25.2143	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.4757	-30.8005	-49.3752	-60.0090	-67.2153	-61.9058	-61.0324	-55.8449	-46.6209	-36.3901	-22.2914	-16.4374	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0210	-0.3576	-1.8819	-5.7344	-11.0232	-12.9907	-12.7734	-10.1688	-6.7620	-2.3085	-0.3016	0.0619	(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	1269.5311	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	170.0000	
Water heating fuel used	1377.0938	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
Total electricity for the above, kWh/year	41.0000	(231)
Electricity for lighting (calculated in Appendix L)	197.9912	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-591.6180	(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	2293.9982	(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	1269.5311	0.1567	198.8806	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1377.0938	0.1431	197.1171	(264)
Space and water heating			395.9976	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	197.9912	0.1443	28.5762	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-527.3987	0.1332	-70.2508	
PV Unit electricity exported	-64.2192	0.1135	-7.2916	
Total			-77.5423	(269)
Total CO2, kg/year			352.7188	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1269.5311	1.5800	2005.8190	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1377.0938	1.5294	2106.1396	(278)
Space and water heating			4111.9586	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	197.9912	1.5338	303.6855	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-527.3987	1.4922	-786.9995	
PV Unit electricity exported	-64.2192	0.4161	-26.7203	
Total			-813.7197	(283)
Total Primary energy kWh/year			3663.9492	(286)
Dwelling Primary energy Rate (DPER)			48.2100	(287)

Full SAP Calculation Printout

Property Reference	Grosvenor 3BH END 150 - Green	**Issued on Date**	14/03/2024
Assessment Reference	Grosvenor 3BH END 150 Green	**Prop Type Ref**	3BH END 150 - Be Green
Property	Grosvenor Garages, Fitzgerald Avenue, East Sheen, London, SW14 8SZ		

SAP Rating	88 B	**DER**	2.54	**TER**	9.58
Environmental	97 A	**% DER < TER**			73.49
CO_2 Emissions (t/year)	0.31	**DFEE**	33.66	**TFEE**	38.24
Compliance Check	See BREL	**% DFEE < TFEE**			11.99
% DPER < TPER	47.28	**DPER**	26.40	**TPER**	50.07

Assessor Details	Mr. Ivan Ball	**Assessor ID**	X001-7283
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.8800	(1b)	x 2.5000	(2b) =	162.2000	(1b) - (3b)
First floor	46.5500	(1c)	x 2.5000	(2c) =	116.3750	(1c) - (3c)
Second floor	39.1600	(1d)	x 2.5000	(2d) =	97.9000	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	150.5900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		376.4750	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.0797 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2297 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1780 (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	0.2270	0.2225	0.2181	0.1958	0.1914	0.1691	0.1691	0.1647	0.1780	0.1914	0.2003	0.2092	(22b)
Effective ac	0.5258	0.5248	0.5238	0.5192	0.5183	0.5143	0.5143	0.5136	0.5158	0.5183	0.5201	0.5219	(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	
Opening Type 1 (Uw = 1.20)			22.2700	1.1450	25.5000			(27)
Heatloss Floor 1			64.8800	0.1100	7.1368			(28a)
External Wall 1	165.1300	19.8400	145.2900	0.1500	21.7935			(29a)
Low Level Walls inc Dormers	15.3100	2.4300	12.8800	0.1500	1.9320			(29a)
Flat Roof	64.8800		64.8800	0.1200	7.7856			(30)
Total net area of external elements Aum(A, m2)			310.2000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		64.1479			(33)
Party Wall 1			87.9300	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	24.6200	0.0460	1.1325
E2 Other lintels (including other steel lintels)	14.5800	0.0280	0.4082
E3 Sill	9.6800	0.0240	0.2323
E4 Jamb	25.2000	0.0190	0.4788
E6 Intermediate floor within a dwelling	41.4300	0.0000	0.0000
E18 Party wall between dwellings	15.0000	0.0410	0.6150

P1 Party wall - Ground floor	13.2300	0.1600	2.1168	
P2 Party wall - Intermediate floor within a dwelling	21.9400	0.0000	0.0000	
E16 Corner (normal)	27.5000	0.0370	1.0175	
E14 Flat roof	31.5700	0.0410	1.2944	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.2955 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 71.4434 (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	65.3181	65.1939	65.0721	64.5000	64.3930	63.8948	63.8948	63.8025	64.0867	64.3930	64.6095	64.8359	(38)
Heat transfer coeff	136.7616	136.6373	136.5155	135.9435	135.8365	135.3382	135.3382	135.2460	135.5301	135.8365	136.0530	136.2793	(39)
Average = Sum(39)m / 12 =												135.9430	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9082	0.9073	0.9065	0.9027	0.9020	0.8987	0.8987	0.8981	0.9000	0.9020	0.9035	0.9050	(40)
HLP (average)												0.9027	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9351 (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

84.7098	83.4517	81.6801	78.4136	75.9677	73.2555	71.7905	73.5497	75.4652	78.3673	81.7011	84.4234	(42b)

Hot water usage for other uses

44.6884	43.0634	41.4383	39.8133	38.1883	36.5632	36.5632	38.1883	39.8133	41.4383	43.0634	44.6884	(42c)

Average daily hot water use (litres/day) 119.1652 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	129.3982	126.5151	123.1185	118.2269	114.1559	109.8187	108.3538	111.7380	115.2785	119.8057	124.7645	129.1118	(44)
Energy conte	204.9351	180.1558	189.2285	161.8467	153.6758	135.0350	131.0445	138.3550	142.1499	162.5752	177.7499	202.1579	(45)
Energy content (annual)										Total = Sum(45)m =		1978.9095	
Distribution loss (46)m = 0.15 x (45)m	30.7403	27.0234	28.3843	24.2770	23.0514	20.2552	19.6567	20.7533	21.3225	24.3863	26.6625	30.3237	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2000	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												0.9360	(55)
Total storage loss	29.0160	26.2080	29.0160	28.0800	29.0160	28.0800	29.0160	29.0160	28.0800	29.0160	28.0800	29.0160	(56)
If cylinder contains dedicated solar storage	29.0160	26.2080	29.0160	28.0800	29.0160	28.0800	29.0160	29.0160	28.0800	29.0160	28.0800	29.0160	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	288.8087	255.9126	273.1021	243.0147	237.5494	185.6270	183.3229	190.6334	192.7419	246.4488	258.9179	286.0315	(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	-7.1708	-16.2765	-35.2357	-57.2352	-79.1387	-82.0674	-80.8056	-66.1338	-45.6811	-24.1812	-9.8156	-5.5475	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	281.6379	239.6361	237.8664	185.7795	158.4108	103.5595	102.5173	124.4997	147.0609	222.2676	249.1023	280.4840	(64)
									Total per year (kWh/year) = Sum(64)m =			2332.8220	(64)
12Total per year (kWh/year)												2333	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	112.0270	99.5409	106.8046	96.2844	94.9833	62.9087	62.1822	64.6130	65.2745	97.9423	101.5722	111.1036	(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	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	146.7553	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	171.7521	190.1541	171.7521	177.4772	171.7521	177.4772	171.7521	171.7521	177.4772	171.7521	177.4772	171.7521	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	321.1636	324.4963	316.0981	298.2193	275.6504	254.4389	240.2683	236.9357	245.3339	263.2127	285.7815	306.9931	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	37.6755	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	-117.4042	(71)
Water heating gains (Table 5)	150.5739	148.1263	143.5545	133.7284	127.6657	87.3732	83.5782	86.8454	90.6590	131.6429	141.0726	149.3328	(72)
Total internal gains	710.5163	729.8033	698.4313	676.4514	642.0948	586.3159	562.6253	562.5597	580.4966	633.6343	671.3578	695.1045	(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	
Southeast	8.4100	36.7938	0.5400	0.7000	0.7700	81.0580	(77)
Northwest	13.8600	11.2829	0.5400	0.7000	0.7700	40.9648	(81)

Solar gains	122.0228	221.4568	339.1491	480.8021	593.8329	613.8608	581.7055	493.6610	387.6175	254.5018	148.6331	102.8227	(83)
Total gains	832.5391	951.2601	1037.5804	1157.2534	1235.9277	1200.1767	1144.3308	1056.2207	968.1141	888.1361	819.9910	797.9272	(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	76.4662	76.5357	76.6040	76.9264	76.9870	77.2704	77.2704	77.3231	77.1610	76.9870	76.8645	76.7368	
alpha	6.0977	6.1024	6.1069	6.1284	6.1325	6.1514	6.1514	6.1549	6.1441	6.1325	6.1243	6.1158	
util living area													
	0.9986	0.9966	0.9907	0.9626	0.8690	0.6918	0.5158	0.5795	0.8447	0.9776	0.9966	0.9990	(86)
Living	19.9184	20.0677	20.2912	20.6042	20.8589	20.9732	20.9961	20.9925	20.9124	20.5941	20.1996	19.8880	
Non living	18.8820	19.0734	19.3586	19.7511	20.0435	20.1527	20.1673	20.1662	20.1043	19.7444	19.2451	18.8452	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4467	20.0677	20.2912	20.6042	20.8589	20.9732	20.9961	20.9925	20.9124	20.5941	20.1996	20.0436	(87)
Th 2	20.1606	20.1613	20.1619	20.1652	20.1658	20.1686	20.1686	20.1691	20.1675	20.1658	20.1646	20.1633	(88)
util rest of house													
	0.9982	0.9955	0.9875	0.9492	0.8270	0.6141	0.4208	0.4798	0.7812	0.9671	0.9953	0.9986	(89)
MIT 2	19.6508	19.0734	19.3586	19.7511	20.0435	20.1527	20.1673	20.1662	20.1043	19.7444	19.2451	19.0827	(90)
Living area fraction										fLA = Living area / (4) =		0.2464	(91)
MIT	19.8469	19.3184	19.5883	19.9612	20.2444	20.3548	20.3715	20.3698	20.3034	19.9538	19.4803	19.3194	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8469	19.3184	19.5883	19.9612	20.2444	20.3548	20.3715	20.3698	20.3034	19.9538	19.4803	19.3194	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9980	0.9939	0.9845	0.9452	0.8314	0.6323	0.4443	0.5044	0.7928	0.9637	0.9937	0.9981	(94)
Useful gains	830.8712	945.4404	1021.5016	1093.8893	1027.5295	758.8118	508.4465	532.7659	767.5251	855.8914	814.8384	796.4480	(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													
	2126.2203	1970.0856	1786.7621	1503.7046	1160.6353	778.8487	510.4233	536.8996	840.7523	1270.5830	1684.3728	2060.4634	(97)
Space heating kWh													
	963.7397	688.5616	569.3538	295.0670	99.0307	0.0000	0.0000	0.0000	0.0000	308.5306	626.0647	940.4275	(98a)
Space heating requirement - total per year (kWh/year)												4490.7756	
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													
	963.7397	688.5616	569.3538	295.0670	99.0307	0.0000	0.0000	0.0000	0.0000	308.5306	626.0647	940.4275	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4490.7756	
Space heating per m2											(98c) / (4) =	29.8212	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												258.1305	(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													
	963.7397	688.5616	569.3538	295.0670	99.0307	0.0000	0.0000	0.0000	0.0000	308.5306	626.0647	940.4275	(98)
Space heating efficiency (main heating system 1)													
	258.1305	258.1305	258.1305	258.1305	258.1305	0.0000	0.0000	0.0000	0.0000	258.1305	258.1305	258.1305	(210)
Space heating fuel (main heating system)													
	373.3537	266.7494	220.5682	114.3093	38.3646	0.0000	0.0000	0.0000	0.0000	119.5251	242.5381	364.3225	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	281.6379	239.6361	237.8664	185.7795	158.4108	103.5595	102.5173	124.4997	147.0609	222.2676	249.1023	280.4840	(64)
Efficiency of water heater												163.8769	(216)
(217)m	163.8769	163.8769	163.8769	163.8769	163.8769	163.8769	163.8769	163.8769	163.8769	163.8769	163.8769	163.8769	(217)
Fuel for water heating, kWh/month													
	171.8595	146.2294	145.1494	113.3653	96.6645	63.1935	62.5575	75.9715	89.7386	135.6308	152.0058	171.1553	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	33.7288	27.0585	24.3632	17.8495	13.7875	11.2645	12.5774	16.3486	21.2352	27.8617	31.4697	34.6662	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.3361	-53.4912	-84.5754	-100.9719	-110.1737	-99.1774	-97.6941	-90.6011	-77.2037	-62.9776	-39.0596	-28.9771	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-0.0146	-0.9700	-4.1179	-11.6342	-22.7940	-27.8847	-27.4527	-21.7514	-14.3319	-4.1426	-0.6301	0.0090	(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												1739.7309	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												163.8769	
Water heating fuel used												1423.5211	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												272.2106	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													

PV generation	-1014.9540	(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	2420.5086	(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	1739.7309	0.1557	270.9571	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1423.5211	0.1446	205.8696	(264)
Space and water heating			476.8267	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	272.2106	0.1443	39.2884	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-879.2388	0.1337	-117.5750	
PV Unit electricity exported	-135.7152	0.1134	-15.3855	
Total			-132.9605	(269)
Total CO2, kg/year			383.1546	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.5400	(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	1739.7309	1.5766	2742.8502	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1423.5211	1.5350	2185.0394	(278)
Space and water heating			4927.8897	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	272.2106	1.5338	417.5257	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-879.2388	1.4942	-1313.7506	
PV Unit electricity exported	-135.7152	0.4153	-56.3654	
Total			-1370.1160	(283)
Total Primary energy kWh/year			3975.2994	(286)
Dwelling Primary energy Rate (DPER)			26.4000	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Grosvenor 4BH MID 177 - Green	**Issued on Date**	14/03/2024
Assessment Reference	Grosvenor 4BH MID 177 Green	**Prop Type Ref**	4BH MID 177 - Be Green
Property	Grosvenor Garages, Fitzgerald Avenue, East Sheen, London, SW14 8SZ		

SAP Rating	93 A	**DER**	1.49	**TER**	7.43
Environmental	98 A	**% DER < TER**			79.95
CO_2 Emissions (t/year)	0.19	**DFEE**	26.75	**TFEE**	28.75
Compliance Check	See BREL	**% DFEE < TFEE**			6.95
% DPER < TPER	59.18	**DPER**	15.77	**TPER**	38.62

Assessor Details	Mr. Ivan Ball	**Assessor ID**	X001-7283
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.5000	(1b)	x 2.5000	(2b) =	156.2500	(1b) - (3b)
First floor	62.5000	(1c)	x 2.5000	(2c) =	156.2500	(1c) - (3c)
Second floor	54.1000	(1d)	x 2.5000	(2d) =	135.2500	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	179.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		447.7500	(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	5 * 10 =	50.0000	(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) =	50.0000 / (5) =	0.1117	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2617	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2028	(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	0.2586	0.2535	0.2484	0.2231	0.2180	0.1927	0.1927	0.1876	0.2028	0.2180	0.2281	0.2383	(22b)
Effective ac	0.5334	0.5321	0.5309	0.5249	0.5238	0.5186	0.5186	0.5176	0.5206	0.5238	0.5260	0.5284	(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	
Opening Type 1 (Uw = 1.20)			22.5800	1.1450	25.8550			(27)
Heatloss Floor 1			62.5000	0.1100	6.8750			(28a)
External Wall 1	82.8000	22.5800	60.2200	0.1500	9.0330			(29a)
Flat Roof	62.5000		62.5000	0.1200	7.5000			(30)
Total net area of external elements Aum(A, m2)			207.8000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		49.2630			(33)
Party Wall 1			191.0800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E5	Ground floor (normal)	9.6300	0.0460	0.4430
E2	Other lintels (including other steel lintels)	13.4600	0.0280	0.3769
E3	Sill	8.5600	0.0240	0.2054
E4	Jamb	30.6000	0.0190	0.5814
E6	Intermediate floor within a dwelling	23.4900	0.0000	0.0000
E18	Party wall between dwellings	30.0000	0.0410	1.2300
P1	Party wall - Ground floor	26.9900	0.1600	4.3184

P2 Party wall - Intermediate floor within a dwelling	49.4400	0.0000	0.0000	
E16 Corner (normal)	20.0000	0.0370	0.7400	
E14 Flat roof	13.8600	0.0410	0.5683	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.4634 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 57.7263 (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	78.8179	78.6261	78.4381	77.5551	77.3899	76.6208	76.6208	76.4784	76.9170	77.3899	77.7241	78.0735	(38)
Heat transfer coeff	136.5442	136.3524	136.1644	135.2814	135.1162	134.3471	134.3471	134.2047	134.6434	135.1162	135.4504	135.7998	(39)

Average = Sum(39)m / 12 = 135.2806

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7624	0.7613	0.7603	0.7553	0.7544	0.7501	0.7501	0.7493	0.7518	0.7544	0.7563	0.7582	(40)
HLP (average)												0.7553	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9746 (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

85.4771	84.2076	82.4200	79.1239	76.6558	73.9190	72.4408	74.2160	76.1488	79.0772	82.4412	85.1881	(42b)

Hot water usage for other uses

45.0932	43.4534	41.8137	40.1739	38.5342	36.8944	36.8944	38.5342	40.1739	41.8137	43.4534	45.0932	(42c)

Average daily hot water use (litres/day) 120.2446 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.5703	127.6611	124.2337	119.2978	115.1900	110.8135	109.3352	112.7501	116.3227	120.8909	125.8946	130.2813	(44)
Energy conte	206.7914	181.7877	190.9425	163.3127	155.0678	136.2581	132.2315	139.6082	143.4375	164.0478	179.3600	203.9891	(45)

Energy content (annual) Total = Sum(45)m = 1996.8344

Distribution loss (46)m = 0.15 x (45)m												
31.0187	27.2682	28.6414	24.4969	23.2602	20.4387	19.8347	20.9412	21.5156	24.6072	26.9040	30.5984	(46)

Water storage loss:
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.2000 (48)
Temperature factor from Table 2b 0.7800 (49)
Enter (49) or (54) in (55) 0.9360 (55)
Total storage loss

29.0160	26.2080	29.0160	28.0800	29.0160	28.0800	29.0160	29.0160	28.0800	29.0160	28.0800	29.0160	(56)

If cylinder contains dedicated solar storage

29.0160	26.2080	29.0160	28.0800	29.0160	28.0800	29.0160	29.0160	28.0800	29.0160	28.0800	29.0160	(57)
Primary loss 54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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

290.6650	257.5445	274.8161	244.4807	238.9414	186.8501	184.5099	191.8866	194.0295	247.9214	260.5280	287.8627	(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 -12.5883	-28.3055	-60.7227	-97.7090	-134.2434	-138.5341	-136.4126	-112.1409	-77.9869	-41.8352	-17.1681	-9.7602	(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

278.0767	229.2390	214.0934	146.7717	104.6980	48.3160	48.0973	79.7458	116.0426	206.0861	243.3599	278.1025	(64)

Total per year (kWh/year) = Sum(64)m = 1992.6291 (64)
12Total per year (kWh/year) 1993 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

112.6442	100.0834	107.3745	96.7719	95.4461	63.3154	62.5769	65.0297	65.7026	98.4320	102.1076	111.7125	(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	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	148.7316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	194.2123	215.0207	194.2123	200.6860	194.2123	200.6860	194.2123	194.2123	200.6860	194.2123	200.6860	194.2123	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	350.7205	354.3599	345.1887	325.6645	301.0187	277.8550	262.3803	258.7409	267.9121	287.4363	312.0821	335.2458	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	37.8732	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	-118.9853	(71)
Water heating gains (Table 5)	151.4035	148.9337	144.3205	134.4054	128.2878	87.9381	84.1087	87.4055	91.2536	132.3010	141.8161	150.1511	(72)
Total internal gains	763.9558	785.9338	751.3410	728.3754	691.1382	634.0986	608.3208	607.9781	627.4711	681.5691	722.2037	747.2286	(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	
Southeast	8.4100	36.7938	0.5400	0.7000	0.7700	81.0580	(77)
Northwest	14.1700	11.2829	0.5400	0.7000	0.7700	41.8810	(81)

Solar gains	122.9390	223.3218	342.5093	486.3205	601.2507	621.7690	589.1034	499.5587	391.7119	256.7811	149.7860	103.5709	(83)
Total gains	886.8948	1009.2556	1093.8503	1214.6958	1292.3889	1255.8676	1197.4242	1107.5369	1019.1831	938.3501	871.9897	850.7996	(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	91.0877	91.2159	91.3418	91.9380	92.0504	92.5773	92.5773	92.6756	92.3737	92.0504	91.8233	91.5870	
alpha	7.0725	7.0811	7.0895	7.1292	7.1367	7.1718	7.1718	7.1784	7.1582	7.1367	7.1216	7.1058	
util living area													
	0.9992	0.9978	0.9932	0.9663	0.8644	0.6697	0.4921	0.5537	0.8332	0.9807	0.9978	0.9994	(86)
Living	20.1022	20.2346	20.4279	20.7013	20.9101	20.9879	20.9988	20.9973	20.9485	20.6872	20.3470	20.0776	
Non living	19.2144	19.3846	19.6318	19.9765	20.2149	20.2895	20.2963	20.2964	20.2582	19.9638	19.5323	19.1857	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5407	20.2346	20.4279	20.7013	20.9101	20.9879	20.9988	20.9973	20.9485	20.6872	20.3470	20.2066	(87)
Th 2	20.2860	20.2870	20.2879	20.2922	20.2930	20.2968	20.2968	20.2975	20.2953	20.2930	20.2914	20.2897	(88)
util rest of house													
	0.9990	0.9971	0.9908	0.9546	0.8254	0.6025	0.4143	0.4711	0.7745	0.9719	0.9969	0.9992	(89)
MIT 2	19.8588	19.3846	19.6318	19.9765	20.2149	20.2895	20.2963	20.2964	20.2582	19.9638	19.5323	19.3847	(90)
Living area fraction										fLA = Living area / (4) =		0.1921	(91)
MIT	19.9898	19.5479	19.7847	20.1157	20.3484	20.4237	20.4312	20.4310	20.3908	20.1028	19.6888	19.5425	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9898	19.5479	19.7847	20.1157	20.3484	20.4237	20.4312	20.4310	20.3908	20.1028	19.6888	19.5425	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9989	0.9960	0.9886	0.9511	0.8287	0.6149	0.4293	0.4870	0.7831	0.9689	0.9959	0.9990	(94)
Useful gains	885.8780	1005.2654	1081.4160	1155.3538	1071.0030	772.2776	514.0283	539.3638	798.1679	909.1288	868.3824	849.9321	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	2142.3503	1997.2720	1808.9049	1517.2727	1168.5422	782.3938	514.7173	540.9841	847.0102	1283.9777	1705.1543	2083.5137	(97)
Space heating kWh													
	934.8154	666.6284	541.2518	260.5816	72.5692	0.0000	0.0000	0.0000	0.0000	278.8875	602.4758	917.7847	(98a)
Space heating requirement - total per year (kWh/year)												4274.9944	
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													
	934.8154	666.6284	541.2518	260.5816	72.5692	0.0000	0.0000	0.0000	0.0000	278.8875	602.4758	917.7847	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4274.9944	
Space heating per m2											(98c) / (4) =	23.8693	(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 %) 280.1436 (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													
	934.8154	666.6284	541.2518	260.5816	72.5692	0.0000	0.0000	0.0000	0.0000	278.8875	602.4758	917.7847	(98)
Space heating efficiency (main heating system 1)													
	280.1436	280.1436	280.1436	280.1436	280.1436	0.0000	0.0000	0.0000	0.0000	280.1436	280.1436	280.1436	(210)
Space heating fuel (main heating system)													
	333.6914	237.9595	193.2051	93.0171	25.9043	0.0000	0.0000	0.0000	0.0000	99.5516	215.0596	327.6122	(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													
	278.0767	229.2390	214.0934	146.7717	104.6980	48.3160	48.0973	79.7458	116.0426	206.0861	243.3599	278.1025	(64)
Efficiency of water heater												173.6166	(216)
(217)m	173.6166	173.6166	173.6166	173.6166	173.6166	173.6166	173.6166	173.6166	173.6166	173.6166	173.6166	173.6166	(217)
Fuel for water heating, kWh/month													
	160.1671	132.0375	123.3139	84.5379	60.3042	27.8292	27.7031	45.9321	66.8385	118.7019	140.1709	160.1820	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	38.1395	30.5969	27.5492	20.1837	15.5905	12.7375	14.2221	18.4865	24.0121	31.5052	35.5850	39.1995	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-48.9886	-74.6274	-114.8090	-131.7564	-138.3130	-122.5945	-120.7596	-114.6832	-101.0136	-85.9177	-55.1184	-41.5166	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-0.5017	-2.7413	-9.4874	-23.9793	-43.8771	-50.8509	-50.0670	-39.4674	-25.7728	-8.5810	-1.6998	-0.3367	(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 1526.0008 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 173.6166
Water heating fuel used 1147.7182 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
Total electricity for the above, kWh/year 0.0000 (231)
Electricity for lighting (calculated in Appendix L) 307.8078 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -1407.4607 (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	1574.0661	(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	1526.0008	0.1561	238.1602	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1147.7182	0.1475	169.2815	(264)
Space and water heating			407.4417	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	307.8078	0.1443	44.4262	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1150.0982	0.1345	-154.6485	
PV Unit electricity exported	-257.3625	0.1152	-29.6481	
Total			-184.2966	(269)
Total CO2, kg/year			267.5713	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.4900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1526.0008	1.5778	2407.7031	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1147.7182	1.5457	1774.0549	(278)
Space and water heating			4181.7579	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	307.8078	1.5338	472.1259	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1150.0982	1.4970	-1721.6739	
PV Unit electricity exported	-257.3625	0.4222	-108.6632	
Total			-1830.3371	(283)
Total Primary energy kWh/year			2823.5467	(286)
Dwelling Primary energy Rate (DPER)			15.7700	(287)

Appendix 4 – BRUKL Output Document for the Commercial Unit for the Be Green scenario

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Grosvenor Garage - Be Green

As designed

Date: Thu Mar 14 08:25:10 2024

Administrative information

Building Details

Address: Grosvenor Garage, Fitzgerald Avenue, LONDON, SW14 8SZ

Certifier details

Name: Paul Goddard

Telephone number: 07967339102

Address: 15 Withins Road, Warrington, WA3 4JW

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.2.0

BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 35.66

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	4.93	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	2.66	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	52.74	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	27.48	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.15	0.15	Level 0 - Staff room_W_8
Floors	0.18	0.11	0.11	Level 0 - Staff room_S_3
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	-	-	No heat loss flat roofs
Windows** and roof windows	1.6	1.2	1.2	Level 0 - Office_G_6
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.2	1.2	Level 0 - Office_D_7
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m^2K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	3.5

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- Project HVAC

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

1- Project DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	2.86	0.01
Standard value	2*	N/A

* Standard shown is for all types except absorption and gas engine heat pumps.

Zone-level mechanical ventilation, exhaust, and terminal units

ID	**System type in the Approved Documents**
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

Zone name	**SFP [W/(l/s)]**									**HR efficiency**	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	**Zone**	**Standard**
Level 0 - Staff room	0.3	-	-	-	-	-	-	-	-	-	N/A
Level 0 - WC	0.3	-	-	-	-	-	-	-	-	-	N/A
Level 0 - WC	0.3	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	**General luminaire**	**Display light source**	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
Level 0 - Staff room	115	-	-
Level 0 - Office	115	-	-
Level 0 - WC	115	-	-
Level 0 - Office	115	-	-
Level 0 - Lobby	115	-	-
Level 0 - WC	115	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Level 0 - Staff room	N/A	N/A
Level 0 - Office	NO (-57.2%)	NO
Level 0 - Office	NO (-80.8%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	107.1	107.1
External area [m^2]	196.7	196.7
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	4	3
Average conductance [W/K]	37.82	77.27
Average U-value [W/m^2K]	0.19	0.39
Alpha value* [%]	12.55	23.89

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
100	**Offices and Workshop Businesses**
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	6.19	8.31
Cooling	0	0
Auxiliary	3.33	10.95
Lighting	10.95	7.13
Hot water	6.09	8.98
Equipment*	41.92	41.92
TOTAL**	**26.56**	**35.37**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	8.29	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*8.29*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	121.03	168.35
Primary energy [kWh_{PE}/m^2]	27.48	52.74
Total emissions [kg/m^2]	2.66	4.93

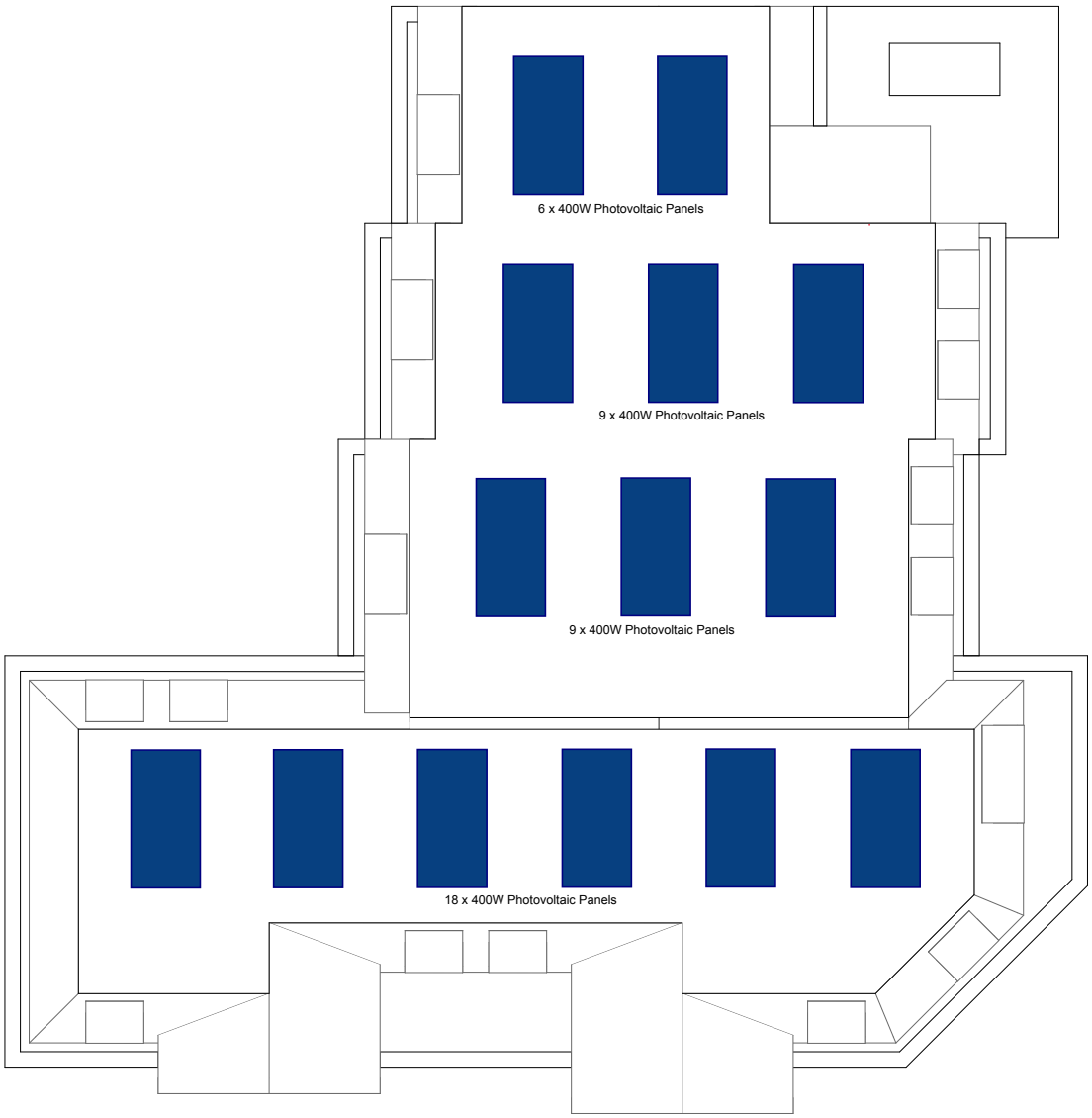
HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: convectors, [HS] ASHP, [HFT] Electricity, [CFT] Natural Gas										
	Actual	55.2	65.8	6.2	0	3.3	2.48	0	2.64	0
	Notional	79	89.3	8.3	0	3.3	2.64	0	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Appendix 5 – Roof Plan showing the Indicative Location of Photovoltaic Panels


6 x 400W Photovoltaic Panels
9 x 400W Photovoltaic Panels
9 x 400W Photovoltaic Panels
18 x 400W Photovoltaic Panels

Appendix 6 – LBRuT Sustainable Construction Checklist

LBRUT Sustainable Construction Checklist - June 2020

This document forms part of the Sustainable Construction Checklist SPD. This document **must** be filled out as part of the planning application for the following developments: all residential development providing **one or more new residential units (including conversions leading to one or more new units)**, and all other forms of development providing **100sqm or more of non-residential floor space**. Developments including new non-residential development of less than 100sqm floor space, extensions less than 100sqm, and other conversions are strongly encouraged to comply with this checklist. Where further information is requested, please either fill in the relevant section, or refer to the document where this information may be found in detail, e.g. Flood Risk Assessment or similar. **Further guidance** on completing the Checklist may be found in the Justification and Guidance section of this SPD.

Property Name (if relevant): Grosvenor Garage, Fitzgerald Ave, East Sheen — Application No. (if known):

Address (include. postcode): Grosvenor Garage, Fitzgerald Ave, East Sheen
Completed by: Ivan Ball

For Non-Residential
Size of development (m2): 107

For Residential
Number of dwellings: 8

1 MINIMUM COMPLIANCE (RESIDENTIAL AND NON-RESIDENTIAL)

Energy Assessment

Has an energy assessment been submitted that demonstrates the expected energy and carbon dioxide emissions saving from energy efficiency and renewable energy measures, including the feasibility of CHP/CCHP and community heating systems? If yes, please select TRUE. — TRUE

Carbon Dioxide emissions reduction

What is the on site carbon dioxide emissions reduction against a Building Regulations Part L (2013) baseline — 68.41 %
Policy LP 22 B. and Draft London Plan Policy 9.2.5 require a 35% onsite reduction in CO_2 emissions beyond Building Regulations 2013.

What is the percentage reduction from efficiency measures alone — 12.7 %
Policy LP 22 C. and Draft London Plan Policy 9.2.6 require a 10% onsite reduction in CO2 emissions beyond Building Regulations 2013 from efficiency measures for residential and 15% for non-residential.

Percentage of **total** site CO2 emissions saved through renewable energy installation? — 55.71 %

What is the total remaining carbon to be offset — 2.696 Tonne
Policy LP 22 B. and Draft London Plan Policy 9.2.4 require Major developments to achieve Zero Carbon after offsetting.

Are remaining emissions going to be offset through offset fund payment in accordance with current guidelines issued for the cost per tonne of CO2? — TRUE

What is the total predicted cost of offset? — 7683 £
The London Plan sets this as £95/tonne per year over 30 years, this should be updated based on As Build calculations.

1A MINIMUM POLICY COMPLIANCE (NON-RESIDENTIAL AND DOMESTIC REFURBISHMENT)

Please check the Guidance Section of this SPD for the policy requirements

Environmental Rating of development:

Non-Residential new-build (100sqm or more)
BREEAM Level: Please Select — Have you attached a pre-assessment to support this? — FALSE
Excellent required under Policy LP22 A 3

Extensions and conversions for residential dwellings
BREEAM Domestic Refurbishment: Please Select — Have you attached a pre-assessment to support this? — FALSE
Excellent required under Policy LP22 A 4

Extensions and conversions for non-residential buildings
BREEAM Level: Please Select — Have you attached a pre-assessment to support this? — FALSE
Excellent required under Policy LP 22

Score awarded for Environmental Rating:
BREEAM: Good = *0*, Very Good = 4, Excellent = *8*, Outstanding = *16*

Subtotal 0

1B MINIMUM POLICY COMPLIANCE (RESIDENTIAL)

Water Usage

	Score	
Internal water usage after gray/rainwater systems limited to 105 litres person per day. (Excluding an allowance 5 litres per person per day for external water consumption). Calculations using the water efficiency calculator for new dwellings have been submitted. *110l/p/d Required for new dwellings under Policy LP22 A 2 105l/p/d required under Draft London Plan Policy SI5*	*1*	TRUE

Subtotal 1

2. ENERGY USE AND POLLUTION

2.1 Need for Cooling

a. How does the development incorporate cooling measures? Tick all that apply:

	Score	
Energy efficient design incorporating specific heat demand to less than or equal to 15 kWh/sqm	*6*	TRUE
Reduce heat entering a building through providing/improving insulation and living roofs and walls	*2*	TRUE
Reduce heat entering a building through shading	*3*	FALSE
Exposed thermal mass and high ceilings	*4*	FALSE
Passive ventilation	*3*	TRUE
Mechanical ventilation with heat recovery	*1*	FALSE
Active cooling systems, i.e. Air Conditioning Unit	*0*	FALSE

See Draft London Plan SI4

2.2 Heat Generation

b. How have the heating and cooling systems, with preference to the heating system hierarchy, been selected (defined in London Plan policy **SI3**) Tick all heating and cooling systems that will be used in the development:

	Score	
Connection to existing heating or cooling networks powered by renewable energy	*6*	FALSE
Connection to existing heating or cooling networks powered by gas or electricity	*5*	FALSE
Site wide CHP network powered by renewable energy	*4*	FALSE
Site wide CHP network powered by gas	*3*	FALSE
Communal heating and cooling powered by renewable energy	*2*	FALSE
Communal heating and cooling powered by gas or electricity	*1*	FALSE
Individual heating and cooling	*0*	TRUE

See Draft London Plan SI3

2.3 Pollution: Air, Noise and Light

a. Does the development plan to implement reduction strategies for dust emissions from construction sites? — *2* — TRUE

b. Does the development plan to include a biomass boiler? — FALSE
If yes, please refer to the biomass guidelines for the Borough of Richmond, please see guidance for supplementary information. If the proposed boiler is of a qualifying size, you may need to complete the information request form found on the Richmond website.

c. Has an air quality impact assessment been provided — FALSE
If yes, has 'Emissions Neutral' been achieved — *1* — TRUE
If yes, have occupants of new development been protected from existing pollution — *1* — FALSE
If no to any of the above are there any sensitive receptors as defined in Policy LP 10 present? — *-1* — FALSE
see Policy LP 10

d. Please tick only one option below
Has the development taken measures to reduce existing noise and enhance the existing soundscape of the site? — *3* — TRUE
Has the development taken care to not create any new noise generation/transmission issues in its intended operation? — *1* — TRUE
see Policy LP 10

e. Has the development taken measures to reduce light pollution impacts on character, residential amenity and biodiversity? — *3* — TRUE

see Policy LP 10

f. Have you attached a Lighting Pollution Report? -

Subtotal 21

Please give any additional relevant comments to the Energy Use and Pollution Section below

The proposals include all electric systems on site. Therefore will be no on-site emissions.

3. TRANSPORT

3.1 Provision for the safe efficient and sustainable movement of people and goods

a. Does your development provide opportunities for occupants to use innovative travel technologies? — FALSE

Please explain:

		Score	
b.	Does your development provide for 100% active provision for electric vehicle charging point(s) and have you successfully demonstrated that it would be able to operate satisfactorily in the future expectation of all vehicles being electrically powered?	2	TRUE
c.	**For major developments ONLY**: Has a Transport Assessment been produced for your development based on TfL's Best Practice Guidance?		
	If you have provided a Transport Assessment as part of your planning application, please tick here and move to Section 3 of this Checklist.	5	FALSE
	See policy LP44		
d.	**For smaller developments ONLY**: Have you provided a Transport Statement?	5	TRUE
e.	Does your development provide cycle storage? (Standard space requirements are set out in the Council's Parking Standards - Local Plan Appendix 3)	2	TRUE
	If so, for how many bicycles?	7	
	Is this shown on the site plans?		TRUE
	See Local Plan Appendix 3		
f.	Will the development create or improve links with local and wider transport networks? If yes, please provide details.	2	FALSE

Subtotal 9

Please give any additional relevant comments to the Transport Section below

Cycle storage is provided.

4 BIODIVERSITY

4.1 Minimising the threat to biodiversity from new buildings, lighting, hard surfacing and people

a.	Does your development involve the loss of an ecological feature or habitat, including a loss of garden or other green space? (Indicate if yes)			-2		FALSE
	If so, please state how much in sqm?				sqm	
b.	Does your development involve the removal of any tree(s)? (Indicate if yes)					FALSE
	If so, has a tree report been provided in support of your application? (Indicate if yes)					FALSE
c.	Does your development plan to add (and not remove) any tree(s) on site? (Indicate if yes)					FALSE
d.	Please indicate which features and/or habitats that your development will incorporate to improve on site biodiversity:					
	Pond, reedbed or extensive native planting	6	Area provided:		sqm	FALSE
	An extensive green roof	5	Area provided:		sqm	FALSE
	An intensive green roof	4	Area provided:	264	sqm	TRUE
	Garden space	4	Area provided:		sqm	TRUE
	Additional native and/or wildlife friendly planting to peripheral areas	3	Area provided:		sqm	FALSE
	Additional planting to peripheral areas	2	Area provided:		sqm	FALSE
	A living wall	2	Area provided:		sqm	FALSE
	Bat boxes	0.5				TRUE
	Bird boxes	0.5				TRUE
	Swift boxes	0.5				TRUE
	Other	0.5				FALSE
e.	Does your development use at least 70% of available roof plate as green/brown roof			1		FALSE
	Policy LP 17 requires 70%					

Subtotal 9.5

Please give any additional relevant comments to the Biodiversity Section below

A green roof is provided. Bat boxes, Bird boxes and Swift boxes could be installed.

5 FLOODING AND DRAINAGE

5.1 Mitigating the risks of flooding and other impacts of climate change in the borough

a.	Is your site located in a high flood risk zone (Zone 3)? (Indicate if yes)	-2		FALSE
	Have you submitted a Flood Risk Assessment? (Indicate if yes)			TRUE
b.	Which of the following measures of the drainage hierarchy are incorporated onto your site? (tick all that apply)			
	Store rainwater for later use	5		FALSE
	Use of infiltration techniques such as porous surfacing materials to allow drainage on-site	3		TRUE
	Attenuate rainwater in ponds or open water features	4		FALSE
	Store rainwater in tanks for gradual release to a watercourse	3		FALSE
	Discharge rainwater directly to watercourse	2		FALSE
	Discharge rainwater to surface water drain	1		FALSE
	Discharge rainwater to combined sewer	0		TRUE
	Have you submitted a Drainage Statement (Indicate if yes)			FALSE
	See Policy LP 21 and Draft London Plan SL 13			
c.	Please give the change in area of permeable surfacing which will result from your development proposal:	0	sqm	
	Please provide details of the permeable surfacing below	*please represent a loss in permeable area as a negative number*		

Subtotal 3

Please give any additional relevant comments to the Flooding and Drainage Section below

6 IMPROVING RESOURCE EFFICIENCY

6.1 Reduce waste generated and amount disposed of by landfill though increasing level of re-use and recycling

a.	Will demolition be required on your site prior to construction? *[Points will only be awarded if 10% or greater of demolition waste is reused/recycled]*	1		TRUE
	If so, what percentage of demolition waste will be reused in the new development?	20	%	
	What percentage of demolition waste will be recycled?	80	%	
b.	Does your site have any contaminated land?	1		FALSE
	Have you submitted an assessment of the site contamination?	2		FALSE

Are plans in place to remediate the contamination?	2	FALSE
Have you submitted a remediation plan?	1	FALSE
Are plans in place to include composting on site?	1	FALSE

c. Will a waste management plan and facilities be in place in line with Policy LP24 — Yes

6.2 Reducing levels of water waste

a. Will the following measures of water conservation be incorporated into the development? (Please tick all that apply):

Fitting of water efficient taps, shower heads etc	1	TRUE
Use of water efficient A or B rated appliances	1	TRUE
Rainwater harvesting for internal use	4	FALSE
Greywater systems	4	FALSE
Fit a water meter	1	TRUE

Subtotal 3

Please give any additional relevant comments to the Improving Resource Efficiency Section below

7 ACCESSIBILITY

7.1 Ensure flexible adaptable and long-term use of structures

a. **If the development is residential,** will it meet the requirements of the nationally described space standard for internal space and layout? 1 TRUE

If the standards are not met, in the space below, please provide details of the functionality of the internal space and layout

AND

b. **If the development is residential**, will it meet Building Regulation Requirement M4 (2) 'accessible and adaptable dwellings'? 2 TRUE

If this is not met, in the space below, please provide details of any accessibility measures included in the development.

For major residential developments, are 10% or more of the units in the development to Building Regulation Requirement M4 (3) 'wheelchair user dwellings'? 1 TRUE

OR

c. **If the development is non-residential,** does it comply with requirements included in Richmond's Local Plan LP1, LP28.B, LP30 & LP45 2 TRUE

Please provide details of the accessibility measures specified in the Local Plan that will be included in the development

Subtotal 6

Please give any additional relevant comments to the Design Standards and Accessibility Section below

LBRUT Sustainable Construction Checklist- Scoring Matrix for *New Construction* **(Non-Residential and domestic refurb)** ***TOTAL*** ***52.5***

Score	Rating	Significance
84 or more	*A+*	Project strives to achieve highest standard in energy efficient sustainable development
75-83	*A*	Makes a major contribution towards achieving sustainable development in Richmond
56-74	*B*	Helps to significantly improve the Borough's stock of sustainable developments
40-55	*C*	Minimal effort to increase sustainability beyond general compliance
39 or less	*FAIL*	Does not comply with SPD Policy

LBRUT Sustainable Construction Checklist- Scoring Matrix for New Construction **Residential new-build**

Score	Rating	Significance
85 or more	A++	Project strives to achieve highest standard in energy efficient sustainable development
68-84	*A+*	Project strives to achieve higher standard in energy efficient sustainable development
59-67	*A*	Makes a major contribution towards achieving sustainable development in Richmond
39-58	*B*	Helps to significantly improve the Borough's stock of sustainable developments
24-38	*C*	Minimal effort to increase sustainability beyond general compliance
23 or less	*FAIL*	Does not comply with SPD Policy

Authorisation:

I herewith declare that I have filled in this form to the best of my knowledge

Signature _____ **Date** _____