Full SAP Calculation Printout

Property Reference	Flat 04_09 top N	**Issued on Date**	25/01/2024
Assessment Reference	Flat 04_09 top N BE LEAN	**Prop Type Ref**	SE_01_009 exposed floor W
Property			

SAP Rating	84 B	**DER**	14.81	**TER**	15.64
Environmental	89 B	**% DER < TER**			5.31
CO_2 Emissions (t/year)	0.74	**DFEE**	33.21	**TFEE**	33.64
Compliance Check	See BREL	**% DFEE < TFEE**			1.26
% DPER < TPER	1.71	**DPER**	83.75	**TPER**	85.21

Assessor Details	Miss Amy Webb	**Assessor ID**	V831-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	53.2000	(1b)	x 2.5300	(2b) =	134.5960	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.2000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		134.5960	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(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) =	0.1162	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation												0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												82.8000	(23c)
Effective ac	0.2342	0.2313	0.2284	0.2139	0.2110	0.1964	0.1964	0.1935	0.2023	0.2110	0.2168	0.2226	(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	
Window (Uw = 1.20)			8.6000	1.1450	9.8473			(27)
Int door			1.7000	1.1000	1.8700			(26)
External Wall 1	49.0600	10.3000	38.7600	0.1500	5.8140	14.0000	542.6400	(29a)
stair wall	17.5300		17.5300	0.1800	3.1554	14.0000	245.4200	(29a)
External Roof 1	53.2000		53.2000	0.1200	6.3840	9.0000	478.8000	(30)
Total net area of external elements Aum(A, m2)			119.7900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.0707			(33)
Party Wall 1			18.1700	0.0000	0.0000	20.0000	363.4000	(32)
Party Floor			53.2000			40.0000	2128.0000	(32d)
Internal Wall 1			97.8100			9.0000	880.2900	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		4638.5500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							87.1908	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	18.0700	0.0400	0.7228	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.1800	0.0000	0.0000	
E16 Corner (normal)	7.5900	0.0900	0.6831	
E18 Party wall between dwellings	5.0600	0.0600	0.3036	
E17 Corner (inverted - internal area greater than external area)	2.5300	0.0000	0.0000	
E3 Sill	1.7500	0.0500	0.0875	
E9 Balcony between dwellings, wall insulation continuous	7.6200	0.1000	0.7620	
E1 Steel lintel with perforated steel base plate	5.0900	0.1000	0.5090	
E4 Jamb	21.2000	0.0500	1.0600	
E14 Flat roof	26.3200	0.0600	1.5792	
P4 Party wall - Roof (insulation at ceiling level)	7.1800	0.0600	0.4308	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1380 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 33.2087 (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	10.4032	10.2741	10.1450	9.4996	9.3705	8.7251	8.7251	8.5960	8.9833	9.3705	9.6287	9.8869	(38)
Heat transfer coeff	43.6119	43.4829	43.3538	42.7083	42.5793	41.9338	41.9338	41.8047	42.1920	42.5793	42.8374	43.0956	(39)
Average = Sum(39)m / 12 =												42.6761	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8198	0.8173	0.8149	0.8028	0.8004	0.7882	0.7882	0.7858	0.7931	0.8004	0.8052	0.8101	(40)
HLP (average)												0.8022	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7845 (42)
Hot water usage for mixer showers

54.1390	53.3253	52.1398	49.8714	48.1974	46.3305	45.2694	46.4460	47.7358	49.7402	52.0573	53.9315	(42a)

Hot water usage for baths

23.4047	23.0572	22.5677	21.6652	20.9894	20.2400	19.8352	20.3213	20.8505	21.6524	22.5735	23.3256	(42b)

Hot water usage for other uses

32.9046	31.7081	30.5115	29.3150	28.1185	26.9219	26.9219	28.1185	29.3150	30.5115	31.7081	32.9046	(42c)

Average daily hot water use (litres/day) 101.5275 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.4483	108.0906	105.2190	100.8515	97.3052	93.4925	92.0266	94.8858	97.9013	101.9041	106.3389	110.1617	(44)
Energy conte	174.9231	153.9195	161.7177	138.0607	130.9915	114.9599	111.2982	117.4884	120.7221	138.2829	151.4992	172.4867	(45)
Energy content (annual)										Total = Sum(45)m =		1686.3499	
Distribution loss (46)m = 0.15 x (45)m	26.2385	23.0879	24.2576	20.7091	19.6487	17.2440	16.6947	17.6233	18.1083	20.7424	22.7249	25.8730	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	230.1999	203.8470	216.9945	191.5544	186.2683	168.4536	166.5750	172.7652	174.2158	193.5597	204.9929	227.7635	(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	230.1999	203.8470	216.9945	191.5544	186.2683	168.4536	166.5750	172.7652	174.2158	193.5597	204.9929	227.7635	(64)
										Total per year (kWh/year) = Sum(64)m =		2337.1897	(64)
12Total per year (kWh/year)												2337	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	102.3834	91.1202	97.9926	88.7001	87.7761	81.0191	81.2281	83.2863	82.9350	90.2005	93.1684	101.5733	(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	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.1654	87.6474	79.1654	81.8043	79.1654	81.8043	79.1654	79.1654	81.8043	79.1654	81.8043	79.1654	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.5356	157.1496	153.0825	144.4239	133.4941	123.2217	116.3590	114.7450	118.8122	127.4707	138.4005	148.6730	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	(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)	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	(71)
Water heating gains (Table 5)	137.6121	135.5955	131.7104	123.1946	117.9786	112.5265	109.1775	111.9440	115.1876	121.2372	129.4006	136.5232	(72)
Total internal gains	422.0800	430.1594	413.7251	399.1897	380.4050	367.3193	354.4688	355.6213	365.5709	377.6402	399.3722	414.1285	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	8.6000	46.7521	0.4000	0.8500	0.7700	94.7352	(78)

Solar gains	94.7352	155.1519	197.6359	223.3715	232.7669	224.0065	218.8680	212.5511	206.4541	167.3458	112.2935	81.8599	(83)
Total gains	516.8152	585.3113	611.3611	622.5612	613.1720	591.3258	573.3368	568.1724	572.0250	544.9860	511.6657	495.9884	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.5443	29.6320	29.7203	30.1694	30.2609	30.7266	30.7266	30.8215	30.5386	30.2609	30.0785	29.8983	
alpha	2.9696	2.9755	2.9814	3.0113	3.0174	3.0484	3.0484	3.0548	3.0359	3.0174	3.0052	2.9932	
util living area	0.8590	0.8110	0.7592	0.6771	0.5719	0.4306	0.3149	0.3302	0.4745	0.6686	0.8040	0.8697	(86)
MIT	19.6519	19.9305	20.2185	20.5452	20.7834	20.9339	20.9808	20.9774	20.9056	20.6250	20.1220	19.6069	(87)
Th 2	20.2362	20.2383	20.2404	20.2509	20.2530	20.2635	20.2635	20.2657	20.2593	20.2530	20.2488	20.2446	(88)
util rest of house	0.8462	0.7950	0.7390	0.6506	0.5368	0.3864	0.2644	0.2800	0.4307	0.6375	0.7851	0.8577	(89)
MIT 2	18.6685	19.0106	19.3633	19.7622	20.0382	20.2078	20.2510	20.2502	20.1764	19.8628	19.2600	18.6193	(90)
Living area fraction									fLA = Living area / (4) =			0.4412	(91)
MIT	19.1024	19.4164	19.7406	20.1076	20.3669	20.5282	20.5730	20.5710	20.4981	20.1991	19.6403	19.0550	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1024	19.4164	19.7406	20.1076	20.3669	20.5282	20.5730	20.5710	20.4981	20.1991	19.6403	19.0550	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8243	0.7760	0.7248	0.6453	0.5423	0.4025	0.2858	0.3011	0.4451	0.6351	0.7683	0.8358	(94)
Useful gains	426.0271	454.1848	443.0966	401.7142	332.5368	238.0086	163.8515	171.0662	254.6242	346.1261	393.1045	414.5519	(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	645.5598	631.2139	574.0283	478.6588	369.0317	248.5905	166.6014	174.3681	269.9476	408.7215	537.1925	640.1838	(97)
Space heating kWh	163.3323	118.9635	97.4132	55.4001	27.1522	0.0000	0.0000	0.0000	0.0000	46.5710	103.7434	167.8701	(98a)
Space heating requirement - total per year (kWh/year)												780.4458	
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	163.3323	118.9635	97.4132	55.4001	27.1522	0.0000	0.0000	0.0000	0.0000	46.5710	103.7434	167.8701	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												780.4458	
Space heating per m2											(98c) / (4) =	14.6700	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Boilers-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.0500	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	163.3323	118.9635	97.4132	55.4001	27.1522	0.0000	0.0000	0.0000	0.0000	46.5710	103.7434	167.8701	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05													
307a	171.4989	124.9117	102.2839	58.1701	28.5098	0.0000	0.0000	0.0000	0.0000	48.8995	108.9305	176.2636	
Space heating requirement	171.4989	124.9117	102.2839	58.1701	28.5098	0.0000	0.0000	0.0000	0.0000	48.8995	108.9305	176.2636	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	230.1999	203.8470	216.9945	191.5544	186.2683	168.4536	166.5750	172.7652	174.2158	193.5597	204.9929	227.7635	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05													
310a	241.7099	214.0393	227.8442	201.1321	195.5817	176.8762	174.9037	181.4035	182.9266	203.2377	215.2425	239.1517	
Water heating fuel	241.7099	214.0393	227.8442	201.1321	195.5817	176.8762	174.9037	181.4035	182.9266	203.2377	215.2425	239.1517	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	10.1529	9.1704	10.1529	9.8254	10.1529	9.8254	10.1529	10.1529	9.8254	10.1529	9.8254	10.1529	(331)
Lighting	16.4490	13.1960	11.8815	8.7049	6.7239	5.4935	6.1338	7.9729	10.3561	13.5877	15.3473	16.9062	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												819.4681	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2454.0491	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.1947	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7280)													
mechanical ventilation fans (SFP = 0.7280)												119.5428	(330a)
Total electricity for the above, kWh/year												119.5428	(331)
Electricity for lighting (calculated in Appendix L)												132.7530	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)

Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	3525.8130	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			92.0000	(367)
Space and Water heating from Boilers	3558.1710	0.2100	187.0525	(367)
Electrical energy for heat distribution (space & water)	8.1947	0.0000	4.7298	(372)
Overall CO2 factor for heat network			0.2297	(386)
Total CO2 associated with community systems			751.9457	(373)
Space and water heating			751.9457	(376)
Pumps, fans and electric keep-hot	119.5428	0.1387	16.5821	(378)
Energy for lighting	132.7530	0.1443	19.1604	(379)
Total CO2, kg/year			787.6881	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.8100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Boilers			92.0000	(467a)
Space and Water heating from Boilers	3558.1710	1.1300	1006.5206	(467)
Electrical energy for heat distribution (space & water)	8.1947	0.0000	50.2299	(472)
Overall CO2 factor for heat network			1.2436	(486)
Total CO2 associated with community systems			4070.9630	(473)
Space and water heating			4070.9630	(476)
Pumps, fans and electric keep-hot	119.5428	1.5128	180.8443	(478)
Energy for lighting	132.7530	1.5338	203.6209	(479)
Total Primary energy kWh/year			4455.4283	(483)
Dwelling Primary energy Rate (DPER)			83.7500	(484)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	53.2000	(1b) x	2.5300	(2b) =	134.5960	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		134.5960	(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) =	0.1486	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3986	(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) =	0.3089	(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	0.3939	0.3861	0.3784	0.3398	0.3321	0.2935	0.2935	0.2857	0.3089	0.3321	0.3475	0.3630	(22b)
Effective ac	0.5776	0.5746	0.5716	0.5577	0.5551	0.5431	0.5431	0.5408	0.5477	0.5551	0.5604	0.5659	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K

TER Opaque door			1.7000	1.0000	1.7000	(26)
TER Opening Type (Uw = 1.20)			8.6000	1.1450	9.8473	(27)
External Wall 1	49.0600	10.3000	38.7600	0.1800	6.9768	(29a)
stair wall	17.5300		17.5300	0.1800	3.1554	(29a)
External Roof 1	53.2000		53.2000	0.1100	5.8520	(30)
Total net area of external elements Aum(A, m2)			119.7900			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.5315	(33)
Party Wall 1			18.1700	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 87.1908 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	18.0700	0.0700	1.2649
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.1800	0.0000	0.0000
E16 Corner (normal)	7.5900	0.0900	0.6831
E18 Party wall between dwellings	5.0600	0.0600	0.3036
E17 Corner (inverted - internal area greater than external area)	2.5300	-0.0900	-0.2277
E3 Sill	1.7500	0.0500	0.0875
E9 Balcony between dwellings, wall insulation continuous	7.6200	0.0200	0.1524
E1 Steel lintel with perforated steel base plate	5.0900	0.0500	0.2545
E4 Jamb	21.2000	0.0500	1.0600
E14 Flat roof	26.3200	0.0800	2.1056
P4 Party wall - Roof (insulation at ceiling level)	7.1800	0.1200	0.8616

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.5455 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	34.0770 (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	25.6534	25.5196	25.3885	24.7726	24.6574	24.1209	24.1209	24.0216	24.3276	24.6574	24.8905	25.1342	(38)
Heat transfer coeff	59.7304	59.5967	59.4655	58.8496	58.7344	58.1980	58.1980	58.0986	58.4046	58.7344	58.9675	59.2112	(39)
Average = Sum(39)m / 12 =												58.8491	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1228	1.1202	1.1178	1.1062	1.1040	1.0939	1.0939	1.0921	1.0978	1.1040	1.1084	1.1130	(40)
HLP (average)												1.1062	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7845 (42)
Hot water usage for mixer showers	54.1390	53.3253	52.1398	49.8714	48.1974	46.3305	45.2694	46.4460	47.7358	49.7402	52.0573	53.9315 (42a)
Hot water usage for baths	23.4047	23.0572	22.5677	21.6652	20.9894	20.2400	19.8352	20.3213	20.8505	21.6524	22.5735	23.3256 (42b)
Hot water usage for other uses	32.9046	31.7081	30.5115	29.3150	28.1185	26.9219	26.9219	28.1185	29.3150	30.5115	31.7081	32.9046 (42c)
Average daily hot water use (litres/day)												101.5275 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.4483	108.0906	105.2190	100.8515	97.3052	93.4925	92.0266	94.8858	97.9013	101.9041	106.3389	110.1617	(44)
Energy conte	174.9231	153.9195	161.7177	138.0607	130.9915	114.9599	111.2982	117.4884	120.7221	138.2829	151.4992	172.4867	(45)
Energy content (annual)										Total = Sum(45)m =		1686.3499	
Distribution loss (46)m = 0.15 x (45)m	26.2385	23.0879	24.2576	20.7091	19.6487	17.2440	16.6947	17.6233	18.1083	20.7424	22.7249	25.8730	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	221.5180	196.0053	208.3126	183.1526	177.5864	160.0517	157.8931	164.0833	165.8140	184.8778	196.5910	219.0816	(62)
WWHRS	-24.7501	-21.8892	-22.9211	-18.9796	-17.6883	-15.1360	-14.1876	-15.0870	-15.6603	-18.4617	-20.9149	-24.2917	(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	196.7679	174.1161	185.3915	164.1730	159.8981	144.9158	143.7055	148.9963	150.1537	166.4161	175.6762	194.7898	(64)
									Total per year (kWh/year) = Sum(64)m =			2005.0000	(64)
12Total per year (kWh/year)												2005	(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	95.4379	84.8468	91.0470	81.9787	80.8306	74.2976	74.2826	76.3408	76.2136	83.2550	86.4470	94.6277	(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	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	89.2227	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.6803	90.4317	81.6803	84.4029	81.6803	84.4029	81.6803	81.6803	84.4029	81.6803	84.4029	81.6803	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.5356	157.1496	153.0825	144.4239	133.4941	123.2217	116.3590	114.7450	118.8122	127.4707	138.4005	148.6730	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	31.9223	(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)	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	-71.3782	(71)
Water heating gains (Table 5)	128.2767	126.2601	122.3751	113.8592	108.6433	103.1912	99.8422	102.6086	105.8522	111.9019	120.0652	127.1878	(72)
Total internal gains	418.2594	426.6083	409.9046	395.4530	376.5845	360.5826	347.6483	348.8008	358.8342	373.8197	395.6355	410.3079	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	8.6000	46.7521	0.6300	0.7000	0.7700	122.8771	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	122.8771	201.2411	256.3454	289.7260	301.9124	290.5496	283.8847	275.6913	267.7831	217.0574	145.6513	106.1772	(83)
Total gains	541.1365	627.8494	666.2500	685.1790	678.4969	651.1322	631.5329	624.4921	626.6172	590.8771	541.2868	516.4851	(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	21.5717	21.6201	21.6678	21.8945	21.9375	22.1397	22.1397	22.1776	22.0614	21.9375	21.8508	21.7608	
alpha	2.4381	2.4413	2.4445	2.4596	2.4625	2.4760	2.4760	2.4785	2.4708	2.4625	2.4567	2.4507	
util living area	0.8827	0.8401	0.7944	0.7245	0.6308	0.5003	0.3785	0.3964	0.5447	0.7229	0.8391	0.8923	(86)
MIT	18.8187	19.1854	19.6002	20.0894	20.5003	20.8020	20.9278	20.9164	20.7389	20.2237	19.4582	18.7515	(87)
Th 2	19.9823	19.9843	19.9863	19.9958	19.9975	20.0058	20.0058	20.0073	20.0026	19.9975	19.9940	19.9902	(88)
util rest of house	0.8694	0.8230	0.7721	0.6937	0.5869	0.4384	0.3014	0.3204	0.4855	0.6866	0.8191	0.8800	(89)
MIT 2	17.4718	17.9241	18.4351	19.0329	19.5142	19.8469	19.9630	19.9555	19.7823	19.2043	18.2780	17.3937	(90)
Living area fraction									fLA = Living area / (4) =			0.4412	(91)
MIT	18.0660	18.4805	18.9491	19.4990	19.9493	20.2683	20.3886	20.3794	20.2043	19.6541	18.7987	17.9927	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0660	18.4805	18.9491	19.4990	19.9493	20.2683	20.3886	20.3794	20.2043	19.6541	18.7987	17.9927	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8384	0.7929	0.7460	0.6769	0.5847	0.4554	0.3319	0.3497	0.4981	0.6728	0.7909	0.8494	(94)
Useful gains	453.6712	497.8499	497.0544	463.7696	396.6980	296.5189	209.6089	218.3899	312.0990	397.5707	428.0960	438.7233	(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	822.2494	809.3553	740.2935	623.7455	484.5163	329.8814	220.4904	231.1990	356.5208	531.7844	689.8414	816.6832	(97)
Space heating kWh	274.2222	209.3317	180.9699	115.1827	65.3368	0.0000	0.0000	0.0000	0.0000	99.8550	188.4567	281.2022	(98a)
Space heating requirement - total per year (kWh/year)												1414.5571	
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	274.2222	209.3317	180.9699	115.1827	65.3368	0.0000	0.0000	0.0000	0.0000	99.8550	188.4567	281.2022	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1414.5571	
Space heating per m2										(98c) / (4) =		26.5894	(99)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	274.2222	209.3317	180.9699	115.1827	65.3368	0.0000	0.0000	0.0000	0.0000	99.8550	188.4567	281.2022	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	297.0988	226.7949	196.0671	124.7917	70.7875	0.0000	0.0000	0.0000	0.0000	108.1852	204.1784	304.6611	(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	196.7679	174.1161	185.3915	164.1730	159.8981	144.9158	143.7055	148.9963	150.1537	166.4161	175.6762	194.7898	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8042	84.4739	84.0057	83.2802	82.2172	79.8000	79.8000	79.8000	79.8000	82.9529	84.2176	84.8824	(217)
Fuel for water heating, kWh/month	232.0261	206.1182	220.6893	197.1334	194.4826	181.5987	180.0821	186.7121	188.1625	200.6152	208.5980	229.4821	(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	16.9715	13.6152	12.2590	8.9815	6.9375	5.6680	6.3287	8.2262	10.6850	14.0194	15.8348	17.4432	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-5.9123	-9.1903	-14.5487	-18.0718	-21.0615	-20.2543	-20.0157	-18.0986	-15.0300	-11.2210	-6.7978	-5.0173	(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	-1.1690	-2.5671	-5.3113	-8.2962	-11.2906	-11.4593	-11.3186	-9.4289	-6.7171	-3.7653	-1.5902	-0.9163	(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	1532.5645	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	2425.7002	(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)	136.9701	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-239.0494	(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	3942.1854	(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	1532.5645	0.2100	321.8386	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2425.7002	0.2100	509.3970	(264)
Space and water heating			831.2356	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	136.9701	0.1443	19.7690	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-165.2194	0.1326	-21.9078	
PV Unit electricity exported	-73.8300	0.1248	-9.2128	
Total			-31.1206	(269)
Total CO2, kg/year			831.8133	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.6400	(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	1532.5645	1.1300	1731.7979	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2425.7002	1.1300	2741.0412	(278)
Space and water heating			4472.8392	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	136.9701	1.5338	210.0893	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-165.2194	1.4899	-246.1679	
PV Unit electricity exported	-73.8300	0.4580	-33.8134	
Total			-279.9813	(283)
Total Primary energy kWh/year			4533.0480	(286)
Target Primary Energy Rate (TPER)			85.2100	(287)