Summary for Input Data

Plot Reference	A 409	Issued on Date	15/05/2026
Assessment Reference	Be Green 260515	Plot Type Ref	
Plot Address		SAP Version	10.2

SAP Rating	84 B	DER	4.50	TER	12.29
Environmental	96 A	% DER < TER			63.38
CO_2 Emissions (t/year)	0.29	DFEE	28.69	TFEE	29.14
Compliance Check	See BREL	% DFEE < TFEE			1.54
% DPER < TPER	27.14	DPER	47.70	TPER	65.47

Assessor Details	Mr. Robert Tanner	Assessor ID	W344-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	Northwest	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Flat, Mid-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	4	
2.0 Number of Storeys	1	
3.0 Date Built	2026	
4.0 Sheltered Sides	3	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	175.97	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	22.50 m	70.59 m²	2.80 m

8.0 Living Area	32.52	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall 1	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.15	70.00	47.39	32.93	0.00	None	14.46	Enter Gross Area
Corridor wall	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.22	70.00	15.60	13.18	0.90	Stairwell Access Corridor 4	2.42	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	40.85	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	154.84

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete planks floor, screed, carpeted	30.00	70.59

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)

Party Floor 1	Lowest occupied	Precast concrete planks floor, screed, carpeted	40.00	70.59

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	Manufacturer	Door to Corridor				0.00			1.00
Window	Manufacturer	Window	Double Low-E Soft 0.1			0.35		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Door	Door	Corridor wall	North West	2.42	
SE windows	Window	External Wall 1	South East	10.72	
NE windows	Window	External Wall 1	North East	3.74	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E1 Steel lintel with perforated steel base plate	Independently assessed	9.16	0.05	0.05	No
E3 Sill	Independently assessed	5.67	0.04	0.04	No
E4 Jamb	Independently assessed	21.60	0.04	0.04	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	19.23	0.05	0.05	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	11.14	0.04	0.04	No
E9 Balcony between dwellings, wall insulation continuous	Independently assessed	8.72	0.05	0.05	No
E16 Corner (normal)	Independently assessed	2.80	0.05	0.05	No
E18 Party wall between dwellings	Independently assessed	5.60	0.05	0.05	No
E25 Staggered party wall between dwellings	Independently assessed	5.60	0.04	0.04	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	29.18	0.00	0.00	No
E24 Eaves (insulation at ceiling level - inverted)	Independently assessed	5.90	0.05	0.05	No

Y-value	0.07	W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500625
Configuration	2
Manufacturer SFP	0.61
Duct Type	Rigid
MVHR Efficiency	89.00
Wet Rooms	2
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0
Number of open flues	0
Number of chimneys/flues attached to closed fire	0
Number of flues attached to solid fuel boiler	0
Number of flues attached to other heater	0
Number of blocked chimneys	0
Number of intermittent extract fans	0
Number of passive vents	0
Number of flueless gas fires	0

Summary for Input Data

elmhurst energy

21.0 Fixed Cooling System	No	
22.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Test Method	Blower Door	

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
Lighting 1	75.00	15.00	1125.00	7

24.0 Main Heating 1	None	
25.0 Main Heating 2	None	
26.0 Heat Networks	Space and Water Combined	
Space Community Heating		
Distribution Loss	Calculated	
Distribution Loss Value	1.50	
SAP Code	2306	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	Heat pump	Electricity	Space and Water	232.00	100.00					
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Community Heating	
SAP Code	901	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Cold Water Source	From header tank	
Bath Count	1	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	8.00		No	
Shower 2	Combi boiler or unvented hot water system	8.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	180.00	L
Loss	1.20	kWh/day

32.0 Photovoltaic Unit	Multiple Dwellings – Not Connected	
Export Capable Meter?	No	
Connected To Dwelling	Yes	
Diverter	No	
Battery Capacity [kWh]	0.00	

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate	Panel Manufacturer

Summary for Input Data

							Reference
0.36	South East	Horizontal	Modest		No	0.80	

34.0 Small-scale Hydro None

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	A 409	Issued on Date	15/05/2026
Assessment Reference	Be Green 260515	Plot Type Ref	
Plot Address		SAP Version	10.2

SAP Rating	84 B	DER	4.50	TER	12.29
Environmental	96 A	% DER < TER			63.38
CO_2 Emissions (t/year)	0.29	DFEE	28.69	TFEE	29.14
Compliance Check	See BREL	% DFEE < TFEE			1.54
% DPER < TPER	27.14	DPER	47.70	TPER	65.47

Assessor Details	Mr. Robert Tanner	Assessor ID	W344-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	70.5900	(1b)	x 2.8000	(2b) =	197.6520	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 70.5900						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		197.6520	(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) =	80.1000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2477	0.2448	0.2419	0.2274	0.2245	0.2099	0.2099	0.2070	0.2157	0.2245	0.2303	0.2361	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.4200	1.0000	2.4200			(26)
Window			14.4600	1.1450	16.5573			(27)
External Wall 1	47.3900	14.4600	32.9300	0.1500	4.9395	70.0000	2305.1000	(29a)
Corridor wall	15.6000	2.4200	13.1800	0.1800	2.3724	70.0000	922.6000	(29a)
Total net area of external elements Aum(A, m2)			62.9900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.2892			(33)
Main dwelling								
Party Wall 1			40.8500	0.0000	0.0000	70.0000	2859.5000	(32)
Party Floor 1			70.5900			40.0000	2823.6000	(32d)
Party Ceiling 1			70.5900			30.0000	2117.7000	(32b)
Internal Wall 1			154.8400			9.0000	1393.5600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12422.0600	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	175.9748	(35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	9.1600	0.0500	0.4580
E3 Sill	5.6700	0.0400	0.2268
E4 Jamb	21.6000	0.0400	0.8640
E7 Party floor between dwellings (in blocks of flats)	19.2300	0.0500	0.9615
E7 Party floor between dwellings (in blocks of flats)	11.1400	0.0360	0.4010
E9 Balcony between dwellings, wall insulation continuous	8.7200	0.0500	0.4360
E16 Corner (normal)	2.8000	0.0500	0.1400
E18 Party wall between dwellings	5.6000	0.0500	0.2800
E25 Staggered party wall between dwellings	5.6000	0.0360	0.2016
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	29.1800	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.9000	0.0500	0.2950

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.2639 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.5531 (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	16.1575	15.9679	15.7784	14.8306	14.6410	13.6932	13.6932	13.5036	14.0723	14.6410	15.0201	15.3993	(38)
Heat transfer coeff	46.7106	46.5210	46.3315	45.3837	45.1941	44.2463	44.2463	44.0567	44.6254	45.1941	45.5732	45.9523	(39)

Average = Sum(39)m / 12 = 45.3363

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6617	0.6590	0.6563	0.6429	0.6402	0.6268	0.6268	0.6241	0.6322	0.6402	0.6456	0.6510	(40)
HLP (average)												0.6422	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2604 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	60.5491	59.6221	58.2559	56.1543	54.2714	51.6371	49.5535	51.9893	53.2144	55.8236	58.5407	60.4945	(42a)
Hot water usage for baths	26.2380	25.8419	25.2784	24.4346	23.6741	22.6273	21.8330	22.8042	23.3139	24.3512	25.4297	26.2172	(42b)
Hot water usage for other uses	37.7784	36.4046	35.0309	33.6571	32.2833	30.9096	30.9096	32.2833	33.6571	35.0309	36.4046	37.7784	(42c)

Average daily hot water use (litres/day) 114.4944 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	124.5654	121.8686	118.5652	114.2460	110.2288	105.1739	102.2961	107.0769	110.1855	115.2056	120.3751	124.4900	(44)
Energy conte	183.3819	161.2568	169.4273	149.2339	142.0410	121.6301	113.0402	126.0315	127.8096	148.4541	162.6909	182.8227	(45)

Energy content (annual) Total = Sum(45)m = 1787.8201

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Distribution loss (46)m = 0.15 x (45)m	27.5073	24.1885	25.4141	22.3851	21.3062	18.2445	16.9560	18.9047	19.1714	22.2681	24.4036	27.4234	(46)

Water storage loss (or HIU 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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	238.6587	211.1842	224.7041	202.7276	197.3178	175.1238	168.3170	181.3083	181.3033	203.7309	216.1846	238.0995	(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	238.6587	211.1842	224.7041	202.7276	197.3178	175.1238	168.3170	181.3083	181.3033	203.7309	216.1846	238.0995	(64)

Total per year (kWh/year) = Sum(64)m = 2438.6598 (64)
12Total per year (kWh/year) 2439 (64)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating, kWh/month	105.1959	93.5598	100.5560	92.4152	91.4501	83.2370	81.8073	86.1269	85.2916	93.5824	96.8897	105.0100	(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	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.6795	111.4666	100.6795	104.0355	100.6795	104.0355	100.6795	100.6795	104.0355	100.6795	104.0355	100.6795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.6701	200.7317	195.5366	184.4769	170.5159	157.3946	148.6287	146.5672	151.7623	162.8220	176.7830	189.9043	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	(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)	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	(71)
Water heating gains (Table 5)	141.3923	139.2259	135.1559	128.3545	122.9168	115.6069	109.9561	115.7620	118.4606	125.7828	134.5690	141.1425	(72)
Total internal gains	497.6474	508.3297	488.2775	473.7723	451.0176	433.9424	416.1698	419.9141	431.1638	446.1898	472.2929	488.6317	(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	3.7400	11.2829	0.3500	0.7000	0.7700	7.1646	(75)

Southeast				10.7200		36.7938		0.3500		0.7000		0.7700	66.9683 (77)
Solar gains	74.1329	128.6555	182.3533	236.5398	274.6152	276.8832	265.1747	236.1184	201.0163	143.8961	89.2275	63.1619 (83)	
Total gains	571.7803	636.9853	670.6308	710.3121	725.6328	710.8256	681.3444	656.0325	632.1801	590.0859	561.5204	551.7936 (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	73.8713	74.1723	74.4758	76.0312	76.3501	77.9856	77.9856	78.3211	77.3230	76.3501	75.7149	75.0902	
alpha	5.9248	5.9448	5.9651	6.0687	6.0900	6.1990	6.1990	6.2214	6.1549	6.0900	6.0477	6.0060	
util living area													
	0.9520	0.9155	0.8572	0.7292	0.5703	0.3976	0.2856	0.3088	0.4841	0.7459	0.9043	0.9581	(86)
MIT	20.4713	20.6277	20.7822	20.9297	20.9853	20.9987	20.9999	20.9998	20.9957	20.9326	20.7168	20.4525	(87)
Th 2	20.3748	20.3772	20.3796	20.3915	20.3939	20.4059	20.4059	20.4083	20.4011	20.3939	20.3891	20.3843	(88)
util rest of house													
	0.9441	0.9029	0.8378	0.7005	0.5355	0.3610	0.2471	0.2691	0.4431	0.7127	0.8884	0.9510	(89)
MIT 2	19.7672	19.9598	20.1456	20.3222	20.3813	20.4051	20.4059	20.4082	20.3980	20.3300	20.0805	19.7522	(90)
Living area fraction									fLA = Living area / (4) =			0.4607	(91)
MIT	20.0916	20.2675	20.4388	20.6021	20.6596	20.6786	20.6795	20.6808	20.6734	20.6076	20.3736	20.0749	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0916	20.2675	20.4388	20.6021	20.6596	20.6786	20.6795	20.6808	20.6734	20.6076	20.3736	20.0749	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9400	0.9005	0.8398	0.7106	0.5508	0.3778	0.2649	0.2874	0.4618	0.7247	0.8880	0.9469	(94)
Useful gains	537.4696	573.5746	563.1843	504.7668	399.7101	268.5488	180.4683	188.5385	291.9403	427.6357	498.6166	522.5193	(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													
	737.6331	714.9104	645.8072	531.0825	404.9206	268.9535	180.5035	188.5961	293.3394	452.2849	604.9225	729.4869	(97)
Space heating kWh													
	148.9216	94.9777	61.4714	18.9473	3.8766	0.0000	0.0000	0.0000	0.0000	18.3390	76.5403	153.9840	(98a)
Space heating requirement - total per year (kWh/year)												577.0579	
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													
	148.9216	94.9777	61.4714	18.9473	3.8766	0.0000	0.0000	0.0000	0.0000	18.3390	76.5403	153.9840	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												577.0579	
Space heating per m2										(98c) / (4) =		8.1748	(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 Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.5000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	148.9216	94.9777	61.4714	18.9473	3.8766	0.0000	0.0000	0.0000	0.0000	18.3390	76.5403	153.9840	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a	223.3824	142.4665	92.2071	28.4210	5.8150	0.0000	0.0000	0.0000	0.0000	27.5085	114.8104	230.9759	
Space heating requirement													
	223.3824	142.4665	92.2071	28.4210	5.8150	0.0000	0.0000	0.0000	0.0000	27.5085	114.8104	230.9759	(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													
	238.6587	211.1842	224.7041	202.7276	197.3178	175.1238	168.3170	181.3083	181.3033	203.7309	216.1846	238.0995	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a	357.9880	316.7764	337.0561	304.0914	295.9767	262.6857	252.4756	271.9624	271.9549	305.5964	324.2769	357.1493	
Water heating fuel													
	357.9880	316.7764	337.0561	304.0914	295.9767	262.6857	252.4756	271.9624	271.9549	305.5964	324.2769	357.1493	(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	15.6160	14.1048	15.6160	15.1123	15.6160	15.1123	15.6160	15.6160	15.1123	15.6160	15.1123	15.6160	(331)
Lighting	21.4038	17.1709	15.4605	11.3270	8.7493	7.1483	7.9814	10.3746	13.4755	17.6806	19.9702	21.9987	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-3.9330	-6.9718	-12.8402	-18.0371	-22.5150	-22.1931	-21.7298	-18.7164	-14.0925	-9.0811	-4.7197	-3.2117	(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												865.5868	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3657.9898	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												8.6559	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)													
mechanical ventilation fans (SFP = 0.7625)												183.8658	(330a)
Total electricity for the above, kWh/year												183.8658	(331)
Electricity for lighting (calculated in Appendix L)												172.7409	(332)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-158.0414	(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	4722.1419	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			232.0000	(367)
Space and Water heating from Heat pump	1949.8175	0.1581	58.9966	(367)
Electrical energy for heat distribution (space & water)	8.6559	0.0000	6.5196	(372)
Overall CO2 factor for heat network			0.0636	(386)
Total CO2 associated with community systems			287.5366	(373)
Space and water heating			287.5366	(376)
Pumps, fans and electric keep-hot	183.8658	0.1387	25.5044	(378)
Energy for lighting	172.7409	0.1443	24.9319	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-158.0414	0.1306	-20.6343	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-20.6343	(380)
Total CO2, kg/year			317.3386	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			232.0000	(467a)
Space and Water heating from Heat pump	1949.8175	1.5853	591.4880	(467)
Electrical energy for heat distribution (space & water)	8.6559	0.0000	69.3483	(472)
Overall CO2 factor for heat network			0.6761	(486)
Total CO2 associated with community systems			3058.4987	(473)
Space and water heating			3058.4987	(476)
Pumps, fans and electric keep-hot	183.8658	1.5128	278.1521	(478)
Energy for lighting	172.7409	1.5338	264.9558	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-158.0414	1.4823	-234.2651	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-234.2651	(480)
Total Primary energy kWh/year			3367.3415	(483)
Dwelling Primary energy Rate (DPER)			47.7000	(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)	
Main dwelling						
Ground floor	70.5900	(1b)	x 2.8000	(2b) =	197.6520	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.5900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	197.6520	(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) =	0.1518	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4018	(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) =	0.3114	(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	0.3970	0.3892	0.3814	0.3425	0.3347	0.2958	0.2958	0.2880	0.3114	0.3347	0.3503	0.3659	(22b)
Effective ac	0.5788	0.5757	0.5727	0.5587	0.5560	0.5438	0.5438	0.5415	0.5485	0.5560	0.5614	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			2.4200	1.0000	2.4200			(26)
TER Opening Type			14.4600	1.1450	16.5573			(27)
External Wall 1	47.3900	14.4600	32.9300	0.1800	5.9274			(29a)
Corridor wall	15.6000	2.4200	13.1800	0.1800	2.3724			(29a)
Total net area of external elements Aum(A, m2)			62.9900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.2771			(33)
Main dwelling								
Party Wall 1			40.8500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 175.9748 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	9.1600	0.0500	0.4580
E3 Sill	5.6700	0.0500	0.2835
E4 Jamb	21.6000	0.0500	1.0800
E7 Party floor between dwellings (in blocks of flats)	19.2300	0.0700	1.3461
E7 Party floor between dwellings (in blocks of flats)	11.1400	0.0700	0.7798
E9 Balcony between dwellings, wall insulation continuous	8.7200	0.0200	0.1744
E16 Corner (normal)	2.8000	0.0900	0.2520
E18 Party wall between dwellings	5.6000	0.0600	0.3360
E25 Staggered party wall between dwellings	5.6000	0.0600	0.3360
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	29.1800	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.9000	0.2400	1.4160

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.4618 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 33.7389 (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	37.7529	37.5533	37.3576	36.4387	36.2667	35.4663	35.4663	35.3181	35.7746	36.2667	36.6146	36.9782	(38)
Heat transfer coeff	71.4917	71.2921	71.0965	70.1775	70.0056	69.2052	69.2052	69.0570	69.5135	70.0056	70.3534	70.7170	(39)

Average = Sum(39)m / 12 = 70.1767

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0128	1.0099	1.0072	0.9942	0.9917	0.9804	0.9804	0.9783	0.9847	0.9917	0.9966	1.0018	(40)
HLP (average)												0.9941	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2604 (42)

Hot water usage for mixer showers	62.1185	61.1850	59.8247	57.2219	55.3012	53.1592	51.9417	53.2917	54.7716	57.0714	59.7301	61.8805	(42a)
Hot water usage for baths	26.8362	26.4377	25.8764	24.8416	24.0667	23.2075	22.7434	23.3007	23.9075	24.8269	25.8831	26.7455	(42b)
Hot water usage for other uses	37.7784	36.4046	35.0309	33.6571	32.2833	30.9096	30.9096	32.2833	33.6571	35.0309	36.4046	37.7784	(42c)
Average daily hot water use (litres/day)												116.4966	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	126.7331	124.0273	120.7319	115.7206	111.6512	107.2762	105.5946	108.8757	112.3362	116.9292	122.0178	126.4044	(44)
Energy conte	200.7143	176.6132	185.5605	158.4157	150.3040	131.9086	127.7075	134.8109	138.5218	158.6718	173.8367	197.9187	(45)
Energy content (annual)										Total = Sum(45)m =		1934.9837	
Distribution loss (46)m = 0.15 x (45)m	30.1071	26.4920	27.8341	23.7624	22.5456	19.7863	19.1561	20.2216	20.7783	23.8008	26.0755	29.6878	(46)
Water storage loss (or HIU loss):													
Store volume												180.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8381	(55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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	249.9569	221.0904	234.8032	206.0699	199.5467	179.5628	176.9502	184.0536	186.1760	207.9145	221.4909	247.1614	(62)
WWHRS	-28.3980	-25.1154	-26.2994	-21.7770	-20.2953	-17.3669	-16.2787	-17.3107	-17.9684	-21.1828	-23.9975	-27.8721	(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	221.5589	195.9750	208.5037	184.2930	179.2513	162.1960	160.6715	166.7428	168.2075	186.7317	197.4933	219.2893	(64)
								Total per year (kWh/year) = Sum(64)m =				2250.9142	(64)
12Total per year (kWh/year)												2251	(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	106.1316	94.3057	101.0930	90.7966	89.3702	81.9830	81.8569	84.2188	84.1818	92.1525	95.9240	105.2021	(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	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.6795	111.4666	100.6795	104.0355	100.6795	104.0355	100.6795	100.6795	104.0355	100.6795	104.0355	100.6795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.6701	200.7317	195.5366	184.4769	170.5159	157.3946	148.6287	146.5672	151.7623	162.8220	176.7830	189.9043	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	(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)													
	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	(71)
Water heating gains (Table 5)													
	142.6500	140.3358	135.8777	126.1064	120.1213	113.8653	110.0227	113.1973	116.9192	123.8609	133.2278	141.4007	(72)
Total internal gains													
	501.9051	512.4396	491.9993	474.5242	451.2221	432.2008	416.2364	417.3494	429.6224	447.2679	473.9517	491.8899	(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	3.7400	11.2829	0.6300	0.7000	0.7700	12.8963	(75)
Southeast	10.7200	36.7938	0.6300	0.7000	0.7700	120.5429	(77)

Solar gains	133.4392	231.5800	328.2359	425.7717	494.3073	498.3897	477.3144	425.0131	361.8294	259.0131	160.6095	113.6914	(83)
Total gains	635.3444	744.0196	820.2352	900.2959	945.5294	930.5905	893.5508	842.3625	791.4518	706.2809	634.5613	605.5813	(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	48.2653	48.4005	48.5337	49.1692	49.2900	49.8600	49.8600	49.9670	49.6389	49.2900	49.0463	48.7941	
alpha	4.2177	4.2267	4.2356	4.2779	4.2860	4.3240	4.3240	4.3311	4.3093	4.2860	4.2698	4.2529	
util living area													
	0.9660	0.9372	0.8888	0.7861	0.6382	0.4657	0.3386	0.3736	0.5764	0.8229	0.9383	0.9713	(86)
MIT	19.8109	20.0760	20.3804	20.7088	20.9020	20.9803	20.9960	20.9940	20.9516	20.6975	20.2129	19.7672	(87)
Th 2	20.0727	20.0751	20.0774	20.0882	20.0902	20.0997	20.0997	20.1015	20.0961	20.0902	20.0861	20.0818	(88)
util rest of house													
	0.9591	0.9253	0.8686	0.7514	0.5879	0.4039	0.2704	0.3022	0.5104	0.7852	0.9245	0.9653	(89)
MIT 2	18.7097	19.0396	19.4114	19.8010	20.0071	20.0871	20.0981	20.0988	20.0620	19.8000	19.2228	18.6617	(90)
Living area fraction									fLA = Living area / (4) =			0.4607	(91)
MIT	19.2170	19.5170	19.8578	20.2192	20.4193	20.4986	20.5117	20.5112	20.4718	20.2135	19.6789	19.1710	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2170	19.5170	19.8578	20.2192	20.4193	20.4986	20.5117	20.5112	20.4718	20.2135	19.6789	19.1710	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9512	0.9168	0.8632	0.7566	0.6067	0.4316	0.3018	0.3350	0.5385	0.7907	0.9173	0.9580	(94)
Useful gains	604.3624	682.1521	708.0403	681.2014	573.6066	401.6344	269.6317	282.2063	426.1682	558.4916	582.0744	580.1383	(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													
	1066.4450	1042.0802	949.6948	794.3526	610.4030	408.2126	270.7132	283.9057	442.9252	672.9959	884.9706	1058.7029	(97)
Space heating kWh													
	343.7894	241.8717	179.7910	81.4689	27.3765	0.0000	0.0000	0.0000	0.0000	85.1912	218.0852	356.0521	(98a)
Space heating requirement - total per year (kWh/year)												1533.6260	
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													
	343.7894	241.8717	179.7910	81.4689	27.3765	0.0000	0.0000	0.0000	0.0000	85.1912	218.0852	356.0521	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1533.6260	
Space heating per m2											(98c) / (4) =	21.7258	(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													
	343.7894	241.8717	179.7910	81.4689	27.3765	0.0000	0.0000	0.0000	0.0000	85.1912	218.0852	356.0521	(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)													
	372.4696	262.0495	194.7898	88.2653	29.6603	0.0000	0.0000	0.0000	0.0000	92.2982	236.2787	385.7553	(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													
	221.5589	195.9750	208.5037	184.2930	179.2513	162.1960	160.6715	166.7428	168.2075	186.7317	197.4933	219.2893	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0413	84.5328	83.7293	82.3588	80.8862	79.8000	79.8000	79.8000	79.8000	82.4169	84.2827	85.1401	(217)
Fuel for water heating, kWh/month													
	260.5311	231.8331	249.0213	223.7684	221.6094	203.2531	201.3428	208.9509	210.7864	226.5695	234.3224	257.5628	(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	20.9192	16.7822	15.1105	11.0706	8.5512	6.9864	7.8007	10.1397	13.1704	17.2803	19.5181	21.5006	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.6475	-23.4689	-35.8634	-42.9531	-48.6539	-46.2758	-45.7136	-41.9877	-35.8423	-27.9668	-17.6958	-13.3690	(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	-5.0241	-10.8526	-22.1106	-34.0187	-45.7863	-46.3006	-45.7553	-38.3689	-27.6405	-15.7803	-6.7898	-3.9521	(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	1661.5667	(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	2729.5512	(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)	168.8300	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-697.8175	(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	3948.1304	(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	1661.5667	0.2100	348.9290	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2729.5512	0.2100	573.2058	(264)
Space and water heating			922.1348	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	168.8300	0.1443	24.3674	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-395.4378	0.1333	-52.7147	
PV Unit electricity exported	-302.3797	0.1252	-37.8572	
Total			-90.5719	(269)
Total CO2, kg/year			867.8596	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2900	(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	1661.5667	1.1300	1877.5703	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2729.5512	1.1300	3084.3929	(278)
Space and water heating			4961.9632	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	168.8300	1.5338	258.9571	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-395.4378	1.4926	-590.2333	
PV Unit electricity exported	-302.3797	0.4595	-138.9517	
Total			-729.1851	(283)
Total Primary energy kWh/year			4621.8360	(286)
Target Primary Energy Rate (TPER)			65.4700	(287)

Full SAP Calculation Printout

Plot Reference	A 409	Issued on Date	15/05/2026
Assessment Reference	Be Green 260515	Plot Type Ref	
Plot Address		SAP Version	10.2

SAP Rating	84 B	DER	4.50	TER	12.29
Environmental	96 A	% DER < TER			63.38
CO_2 Emissions (t/year)	0.29	DFEE	28.69	TFEE	29.14
Compliance Check	See BREL	% DFEE < TFEE			1.54
% DPER < TPER	27.14	DPER	47.70	TPER	65.47

Assessor Details	Mr. Robert Tanner	Assessor ID	W344-0001
Client			

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

---
1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	70.5900 (1b)	x	2.8000 (2b)	=	197.6520	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 70.5900						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.6520	(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) =	0.1518	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3018	(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) =	0.2339	(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	0.2982	0.2924	0.2865	0.2573	0.2514	0.2222	0.2222	0.2163	0.2339	0.2514	0.2631	0.2748	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5445	0.5427	0.5410	0.5331	0.5316	0.5247	0.5247	0.5234	0.5274	0.5316	0.5346	0.5378	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			2.4200	1.0000	2.4200			(26)
Window			14.4600	1.1450	16.5573			(27)
External Wall 1	47.3900	14.4600	32.9300	0.1500	4.9395	70.0000	2305.1000	(29a)
Corridor wall	15.6000	2.4200	13.1800	0.1800	2.3724	70.0000	922.6000	(29a)
Total net area of external elements Aum(A, m2)			62.9900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.2892			(33)
Main dwelling								
Party Wall 1			40.8500	0.0000	0.0000	70.0000	2859.5000	(32)
Party Floor 1			70.5900			40.0000	2823.6000	(32d)
Party Ceiling 1			70.5900			30.0000	2117.7000	(32b)
Internal Wall 1			154.8400			9.0000	1393.5600	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12422.0600	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	175.9748	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	9.1600	0.0500	0.4580
E3 Sill	5.6700	0.0400	0.2268

E4 Jamb	21.6000	0.0400	0.8640	
E7 Party floor between dwellings (in blocks of flats)	19.2300	0.0500	0.9615	
E7 Party floor between dwellings (in blocks of flats)	11.1400	0.0360	0.4010	
E9 Balcony between dwellings, wall insulation continuous	8.7200	0.0500	0.4360	
E16 Corner (normal)	2.8000	0.0500	0.1400	
E18 Party wall between dwellings	5.6000	0.0500	0.2800	
E25 Staggered party wall between dwellings	5.6000	0.0360	0.2016	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	29.1800	0.0000	0.0000	
E24 Eaves (insulation at ceiling level - inverted)	5.9000	0.0500	0.2950	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.2639 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.5531 (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	35.5126	35.4000	35.2896	34.7711	34.6741	34.2226	34.2226	34.1389	34.3965	34.6741	34.8704	35.0755	(38)
Heat transfer coeff	66.0657	65.9530	65.8427	65.3242	65.2272	64.7757	64.7757	64.6920	64.9496	65.2272	65.4234	65.6286	(39)

Average = Sum(39)m / 12 = 65.3237

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9359	0.9343	0.9327	0.9254	0.9240	0.9176	0.9176	0.9164	0.9201	0.9240	0.9268	0.9297	(40)
HLP (average)												0.9254	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2604 (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	26.2380	25.8419	25.2784	24.4346	23.6741	22.6273	21.8330	22.8042	23.3139	24.3512	25.4297	26.2172	(42b)
Hot water usage for other uses	37.7784	36.4046	35.0309	33.6571	32.2833	30.9096	30.9096	32.2833	33.6571	35.0309	36.4046	37.7784	(42c)

Average daily hot water use (litres/day) 58.6728 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	64.0163	62.2465	60.3093	58.0917	55.9575	53.5368	52.7426	55.0876	56.9710	59.3821	61.8343	63.9955	(44)
Energy conte	94.2431	82.3647	86.1807	75.8823	72.1069	61.9136	58.2821	64.8391	66.0836	76.5198	83.5711	93.9821	(45)

Energy content (annual) Total = Sum(45)m = 915.9692

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	80.1067	70.0100	73.2536	64.5000	61.2908	52.6265	49.5398	55.1132	56.1710	65.0419	71.0355	79.8848	(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	80.1067	70.0100	73.2536	64.5000	61.2908	52.6265	49.5398	55.1132	56.1710	65.0419	71.0355	79.8848	(64)

Total per year (kWh/year) = Sum(64)m = 778.5738 (64)

12Total per year (kWh/year) 779 (64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Electric shower(s)	49.7466	44.3246	48.4008	46.1883	47.0550	44.8859	46.3821	47.0550	46.1883	48.4008	47.4907	49.7466	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 565.8644 (64a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating, kWh/month	32.4633	28.5837	30.4136	27.6721	27.0865	24.3781	23.9805	25.5420	25.5898	28.3607	29.6315	32.4078	(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	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.6795	111.4666	100.6795	104.0355	100.6795	104.0355	100.6795	100.6795	104.0355	100.6795	104.0355	100.6795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.6701	200.7317	195.5366	184.4769	170.5159	157.3946	148.6287	146.5672	151.7623	162.8220	176.7830	189.9043	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	(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)	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	(71)
Water heating gains (Table 5)	43.6335	42.5352	40.8785	38.4334	36.4065	33.8585	32.2318	34.3307	35.5414	38.1192	41.1549	43.5589	(72)
Total internal gains	399.8886	411.6390	394.0001	383.8512	364.5074	352.1940	338.4455	338.4828	348.2446	358.5261	378.8788	391.0482	(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	3.7400	11.2829	0.3500	0.7000	0.7700	7.1646	(75)
Southeast	10.7200	36.7938	0.3500	0.7000	0.7700	66.9683	(77)

Solar gains	74.1329	128.6555	182.3533	236.5398	274.6152	276.8832	265.1747	236.1184	201.0163	143.8961	89.2275	63.1619	(83)
Total gains	474.0215	540.2945	576.3534	620.3910	639.1226	629.0772	603.6202	574.6012	549.2610	502.4223	468.1063	454.2101	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.2294	52.3186	52.4063	52.8223	52.9008	53.2696	53.2696	53.3384	53.1269	52.9008	52.7421	52.5773	
alpha	4.4820	4.4879	4.4938	4.5215	4.5267	4.5513	4.5513	4.5559	4.5418	4.5267	4.5161	4.5052	
util living area													
	0.9869	0.9757	0.9562	0.9024	0.7970	0.6216	0.4639	0.5051	0.7277	0.9177	0.9752	0.9891	(86)
MIT	19.6725	19.8826	20.1562	20.5171	20.7963	20.9507	20.9895	20.9846	20.8984	20.5447	20.0517	19.6331	(87)
Th 2	20.1371	20.1384	20.1398	20.1460	20.1471	20.1525	20.1525	20.1535	20.1505	20.1471	20.1448	20.1423	(88)
util rest of house													
	0.9841	0.9705	0.9465	0.8806	0.7536	0.5516	0.3783	0.4177	0.6627	0.8948	0.9689	0.9867	(89)
MIT 2	18.9258	19.1339	19.4027	19.7516	20.0018	20.1260	20.1488	20.1477	20.0897	19.7843	19.3075	18.8909	(90)
Living area fraction									fLA = Living area / (4) =			0.4607	(91)
MIT	19.2698	19.4788	19.7498	20.1042	20.3678	20.5059	20.5361	20.5332	20.4623	20.1346	19.6503	19.2328	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2698	19.4788	19.7498	20.1042	20.3678	20.5059	20.5361	20.5332	20.4623	20.1346	19.6503	19.2328	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9804	0.9656	0.9413	0.8795	0.7656	0.5817	0.4175	0.4576	0.6878	0.8944	0.9644	0.9834	(94)
Useful gains	464.7178	521.6947	542.5215	545.6030	489.2837	365.9204	252.0233	262.9418	377.8080	449.3558	451.4495	446.6631	(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													
	988.9889	961.5171	872.4032	731.9075	565.3785	382.5583	254.9627	267.3867	413.2267	621.9153	821.0862	986.5824	(97)
Space heating kWh													
	390.0577	295.5607	245.4320	134.1392	56.6145	0.0000	0.0000	0.0000	0.0000	128.3842	266.1384	401.6999	(98a)
Space heating requirement - total per year (kWh/year)												1918.0267	
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													
	390.0577	295.5607	245.4320	134.1392	56.6145	0.0000	0.0000	0.0000	0.0000	128.3842	266.1384	401.6999	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1918.0267	
Space heating per m2											(98c) / (4) =	27.1714	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	608.8912	479.3399	491.6595	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8706	0.9264	0.9083	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	530.1186	444.0723	446.5635	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	697.2443	669.5585	637.4725	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	120.3305	167.7617	142.0363	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	30.0826	41.9404	35.5091	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												107.5321	(107)
Energy for space heating												27.1714	(99)
Energy for space cooling												1.5233	(108)
Total												28.6947	(109)
Fabric Energy Efficiency (DFEE)												28.7	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	70.5900	(1b)	x 2.8000	(2b) =	197.6520	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.5900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	197.6520	(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) =	0.1518	(8)

Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4018	(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) =	0.3114	(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	0.3970	0.3892	0.3814	0.3425	0.3347	0.2958	0.2958	0.2880	0.3114	0.3347	0.3503	0.3659	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)
Effective ac	0.5669	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.4200	1.0000	2.4200			(26)
TER Opening Type			14.4600	1.1450	16.5573			(27)
External Wall 1	47.3900	14.4600	32.9300	0.1800	5.9274			(29a)
Corridor wall	15.6000	2.4200	13.1800	0.1800	2.3724			(29a)
Total net area of external elements Aum(A, m2)			62.9900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.2771			(33)
Main dwelling								
Party Wall 1			40.8500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	175.9748	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	9.1600	0.0500	0.4580
E3 Sill	5.6700	0.0500	0.2835
E4 Jamb	21.6000	0.0500	1.0800
E7 Party floor between dwellings (in blocks of flats)	19.2300	0.0700	1.3461
E7 Party floor between dwellings (in blocks of flats)	11.1400	0.0700	0.7798
E9 Balcony between dwellings, wall insulation continuous	8.7200	0.0200	0.1744
E16 Corner (normal)	2.8000	0.0900	0.2520
E18 Party wall between dwellings	5.6000	0.0600	0.3360
E25 Staggered party wall between dwellings	5.6000	0.0600	0.3360
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	29.1800	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	5.9000	0.2400	1.4160

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.4618	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	33.7389	(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	37.7529	37.5533	37.3576	36.4387	36.2667	35.4663	35.4663	35.3181	35.7746	36.2667	36.6146	36.9782	(38)
Heat transfer coeff	71.4917	71.2921	71.0965	70.1775	70.0056	69.2052	69.2052	69.0570	69.5135	70.0056	70.3534	70.7170	(39)
Average = Sum(39)m / 12 =												70.1767	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0128	1.0099	1.0072	0.9942	0.9917	0.9804	0.9804	0.9783	0.9847	0.9917	0.9966	1.0018	(40)
HLP (average)												0.9941	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2604	(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	26.8362	26.4377	25.8764	24.8416	24.0667	23.2075	22.7434	23.3007	23.9075	24.8269	25.8831	26.7455	(42b)
Hot water usage for other uses	37.7784	36.4046	35.0309	33.6571	32.2833	30.9096	30.9096	32.2833	33.6571	35.0309	36.4046	37.7784	(42c)
Average daily hot water use (litres/day)												59.2254	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	64.6146	62.8423	60.9073	58.4987	56.3500	54.1171	53.6529	55.5840	57.5646	59.8578	62.2877	64.5239	(44)
Energy conte	102.3337	89.4866	93.6122	80.0818	75.8580	66.5432	64.8886	68.8246	70.9829	81.2264	88.7402	101.0288	(45)
Energy content (annual)										Total = Sum(45)m =		983.6071	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	86.9837	76.0636	79.5704	68.0695	64.4793	56.5617	55.1553	58.5009	60.3355	69.0425	75.4292	85.8745	(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	86.9837	76.0636	79.5704	68.0695	64.4793	56.5617	55.1553	58.5009	60.3355	69.0425	75.4292	85.8745	(64)
									Total per year (kWh/year) = Sum(64)m =			836.0660	(64)
12Total per year (kWh/year)												836	(64)
Electric shower(s)	49.7466	44.3246	48.4008	46.1883	47.0550	44.8859	46.3821	47.0550	46.1883	48.4008	47.4907	49.7466	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						565.8644	(64a)
Heat gains from water heating, kWh/month	34.1826	30.0970	31.9928	28.5644	27.8836	25.3619	25.3843	26.3890	26.6309	29.3608	30.7300	33.9053	(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	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	113.0182	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	100.6795	111.4666	100.6795	104.0355	100.6795	104.0355	100.6795	100.6795	104.0355	100.6795	104.0355	100.6795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	198.6701	200.7317	195.5366	184.4769	170.5159	157.3946	148.6287	146.5672	151.7623	162.8220	176.7830	189.9043	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	34.3018	(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)													
	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	-90.4145	(71)
Water heating gains (Table 5)													
	45.9443	44.7873	43.0011	39.6728	37.4779	35.2249	34.1187	35.4691	36.9874	39.4635	42.6805	45.5716	(72)
Total internal gains													
	402.1994	413.8910	396.1226	385.0906	365.5788	353.5604	340.3324	339.6212	349.6906	359.8704	380.4044	393.0608	(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	3.7400	11.2829	0.6300	0.7000	0.7700	12.8963	(75)
Southeast	10.7200	36.7938	0.6300	0.7000	0.7700	120.5429	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	133.4392	231.5800	328.2359	425.7717	494.3073	498.3897	477.3144	425.0131	361.8294	259.0131	160.6095	113.6914	(83)
Total gains	535.6386	645.4710	724.3586	810.8623	859.8861	851.9501	817.6468	764.6343	711.5200	618.8835	541.0139	506.7522	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.2653	48.4005	48.5337	49.1692	49.2900	49.8600	49.8600	49.9670	49.6389	49.2900	49.0463	48.7941	
alpha	4.2177	4.2267	4.2356	4.2779	4.2860	4.3240	4.3240	4.3311	4.3093	4.2860	4.2698	4.2529	
util living area													
	0.9809	0.9596	0.9208	0.8287	0.6847	0.5047	0.3691	0.4100	0.6283	0.8703	0.9627	0.9845	(86)
MIT	19.6299	19.9162	20.2531	20.6352	20.8716	20.9732	20.9945	20.9914	20.9327	20.6097	20.0594	19.5837	(87)
Th 2	20.0727	20.0751	20.0774	20.0882	20.0902	20.0997	20.0997	20.1015	20.0961	20.0902	20.0861	20.0818	(88)
util rest of house													
	0.9768	0.9513	0.9049	0.7973	0.6343	0.4391	0.2951	0.3324	0.5601	0.8384	0.9535	0.9811	(89)
MIT 2	18.8339	19.1155	19.4414	19.8026	20.0038	20.0862	20.0979	20.0984	20.0583	19.7905	19.2677	18.7955	(90)
Living area fraction										fLA = Living area / (4) =		0.4607	(91)
MIT	19.2006	19.4844	19.8154	20.1862	20.4036	20.4948	20.5109	20.5098	20.4611	20.1679	19.6324	19.1586	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2006	19.4844	19.8154	20.1862	20.4036	20.4948	20.5109	20.5098	20.4611	20.1679	19.6324	19.1586	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9719	0.9449	0.8997	0.8009	0.6523	0.4683	0.3292	0.3680	0.5885	0.8414	0.9480	0.9767	(94)
Useful gains	520.5648	609.8982	651.7277	649.4138	560.9060	398.9691	269.1326	281.3572	418.7584	520.7433	512.8935	494.9636	(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													
	1065.2711	1039.7512	946.6768	792.0379	609.3027	407.9525	270.6562	283.8093	442.1852	669.8064	881.6985	1057.8287	(97)
Space heating kWh													
	405.2614	288.8612	219.4421	102.6893	36.0071	0.0000	0.0000	0.0000	0.0000	110.9030	265.5396	418.7716	(98a)
Space heating requirement - total per year (kWh/year)												1847.4753	
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													
	405.2614	288.8612	219.4421	102.6893	36.0071	0.0000	0.0000	0.0000	0.0000	110.9030	265.5396	418.7716	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1847.4753	
Space heating per m2											(98c) / (4) =	26.1719	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	650.5287	512.1184	524.8329	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9309	0.9631	0.9504	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	605.5851	493.2129	498.8184	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	957.5145	919.4009	859.3969	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	253.3891	317.0839	268.2704	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	63.3473	79.2710	67.0676	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												209.6859	(107)
Energy for space heating												26.1719	(99)
Energy for space cooling												2.9705	(108)
Total												29.1424	(109)
Fabric Energy Efficiency (TFEE)												29.1	(109)