Summary for Input Data

Plot Reference	A 204	Issued on Date	15/05/2026
Assessment Reference	Be Lean 260515	Plot Type Ref	
Plot Address		SAP Version	10.2

SAP Rating	86 B	DER	10.85	TER	11.61
Environmental	91 B	% DER < TER			6.55
CO_2 Emissions (t/year)	0.72	DFEE	26.07	TFEE	25.91
Compliance Check	See BREL	% DFEE < TFEE			-0.63
% DPER < TPER	-2.21	DPER	63.17	TPER	61.80

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

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

Orientation	Northeast	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Flat, End-Terrace	
Position of Flat	Mid-floor flat	
Which Floor	2	
2.0 Number of Storeys	1	
3.0 Date Built	2026	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	170.18	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:	19.60 m	71.15 m²	2.80 m

8.0 Living Area	29.68	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	42.84	29.74	0.00	None	13.10	Enter Gross Area
Corridor wall	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.22	70.00	12.04	9.62	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	40.54	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	170.46

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete planks floor, screed, carpeted	30.00	71.15

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	71.15

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 East	2.42	
SW windows	Window	External Wall 1	South West	7.13	
SE windows	Window	External Wall 1	South East	5.96	

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	8.25	0.05	0.05	No
E3 Sill	Independently assessed	4.76	0.04	0.04	No
E4 Jamb	Independently assessed	18.60	0.04	0.04	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	21.88	0.05	0.05	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	8.60	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
E18 Party wall between dwellings	Independently assessed	2.80	0.04	0.04	No
E25 Staggered party wall between dwellings	Independently assessed	2.80	0.04	0.04	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	28.96	0.00	0.00	No
E16 Corner (normal)	Independently assessed	2.80	0.04	0.04	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	Manufacturer	
Percentage of Heat	100.00	%
Fuel Type	Mains gas	
SAP Code	102	
In Winter	88.80	
In Summer	79.80	
Model Name	x	
Manufacturer	x	
Controls SAP Code	2110	
Controls description	Time and temperature zone control by arrangement	
Delayed Start Stat	Yes	
Burner Control	Modulating	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
27.0 Secondary Heating	None	

28.0 Water Heating

Water Heating	Main Heating 1
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 1	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

Summary for Input Data

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	180.00	L
Loss	1.20	kWh/day
Pipes insulation	Fully insulated primary pipework	

31.0 Thermal Store	None

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Plot Reference	A 204	Issued on Date	15/05/2026
Assessment Reference	Be Lean 260515	Plot Type Ref	
Plot Address		SAP Version	10.2

SAP Rating	86 B	DER	10.85	TER	11.61
Environmental	91 B	% DER < TER			6.55
CO_2 Emissions (t/year)	0.72	DFEE	26.07	TFEE	25.91
Compliance Check	See BREL	% DFEE < TFEE			-0.63
% DPER < TPER	-2.21	DPER	63.17	TPER	61.80

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.1500 (1b)	x	2.8000 (2b)	=	199.2200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 71.1500						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.2200	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(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)

Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493	(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								
Door			2.4200	1.0000	2.4200			(26)
Window			13.0900	1.1450	14.9885			(27)
External Wall 1	42.8400	13.0900	29.7500	0.1500	4.4625	70.0000	2082.5000	(29a)
Corridor wall	12.0400	2.4200	9.6200	0.1800	1.7316	70.0000	673.4000	(29a)
Total net area of external elements Aum(A, m2)			54.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.6026			(33)
Main dwelling								
Party Wall 1			40.5400	0.0000	0.0000	70.0000	2837.8000	(32)
Party Floor 1			71.1500			40.0000	2846.0000	(32d)
Party Ceiling 1			71.1500			30.0000	2134.5000	(32b)
Internal Wall 1			170.4600			9.0000	1534.1400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12108.3400	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	170.1805	(35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	8.2500	0.0500	0.4125
E3 Sill	4.7600	0.0400	0.1904
E4 Jamb	18.6000	0.0400	0.7440
E7 Party floor between dwellings (in blocks of flats)	21.8800	0.0500	1.0940
E7 Party floor between dwellings (in blocks of flats)	8.6000	0.0360	0.3096
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
E18 Party wall between dwellings	2.8000	0.0360	0.1008
E25 Staggered party wall between dwellings	2.8000	0.0360	0.1008
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	28.9600	0.0000	0.0000
E16 Corner (normal)	2.8000	0.0360	0.1008

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.9089 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.5115 (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	17.2287	17.0191	16.8096	15.7618	15.5522	14.5045	14.5045	14.2949	14.9236	15.5522	15.9713	16.3905	(38)
Heat transfer coeff	44.7402	44.5307	44.3211	43.2733	43.0638	42.0160	42.0160	41.8065	42.4351	43.0638	43.4829	43.9020	(39)

Average = Sum(39)m / 12 = 43.2209

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6288	0.6259	0.6229	0.6082	0.6053	0.5905	0.5905	0.5876	0.5964	0.6053	0.6111	0.6170	(40)
HLP (average)												0.6075	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2737 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	60.7673	59.8370	58.4659	56.3567	54.4670	51.8232	49.7321	52.1767	53.4062	56.0248	58.7518	60.7126	(42a)
Hot water usage for baths	26.3321	25.9346	25.3691	24.5223	23.7591	22.7084	21.9114	22.8861	23.3976	24.4386	25.5209	26.3112	(42b)
Hot water usage for other uses	37.9151	36.5364	35.1577	33.7789	32.4002	31.0215	31.0215	32.4002	33.7789	35.1577	36.5364	37.9151	(42c)

Average daily hot water use (litres/day) 114.9072 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	125.0146	122.3080	118.9927	114.6580	110.6263	105.5531	102.6650	107.4630	110.5828	115.6211	120.8091	124.9389	(44)
Energy conte	184.0431	161.8383	170.0382	149.7720	142.5531	122.0687	113.4478	126.4859	128.2705	148.9894	163.2775	183.4820	(45)

Energy content (annual) Total = Sum(45)m = 1794.2664

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Distribution loss (46)m = 0.15 x (45)m	27.6065	24.2757	25.5057	22.4658	21.3830	18.3103	17.0172	18.9729	19.2406	22.3484	24.4916	27.5223	(46)

Water storage loss (or HIU loss):
Store volume 180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.2000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.6480 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880	(56)
If cylinder contains dedicated solar storage	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880	(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	227.3935	200.9935	213.3886	191.7240	185.9035	164.0207	156.7982	169.8363	170.2225	192.3398	205.2295	226.8324	(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	227.3935	200.9935	213.3886	191.7240	185.9035	164.0207	156.7982	169.8363	170.2225	192.3398	205.2295	226.8324	(64)

Total per year (kWh/year) = Sum(64)m = 2304.6824 (64)
12Total per year (kWh/year) 2305 (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	95.8746	85.1354	91.2180	83.3608	82.0792	74.1494	72.4017	76.7369	76.2115	84.2193	87.8514	95.6881	(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	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	102.6656	113.6655	102.6656	106.0878	102.6656	106.0878	102.6656	102.6656	106.0878	102.6656	106.0878	102.6656	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.9661	202.0411	196.8121	185.6802	171.6282	158.4213	149.5982	147.5232	152.7522	163.8841	177.9361	191.1430	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	(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)	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	(71)
Water heating gains (Table 5)	128.8638	126.6896	122.6049	115.7789	110.3216	102.9853	97.3141	103.1410	105.8493	113.1980	122.0158	128.6130	(72)
Total internal gains	491.6012	502.5019	482.1884	467.6526	444.7211	424.6002	406.6838	410.4356	421.7951	439.8535	466.1455	482.5274	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.9600	36.7938	0.3500	0.7000	0.7700	37.2324	(77)
Southwest	7.1300	36.7938	0.3500	0.7000	0.7700	44.5414	(79)

Solar gains	81.7738	139.2910	190.5840	236.1428	264.4996	262.5869	253.1618	232.0063	206.3622	153.9462	97.9461	69.9813	(83)
Total gains	573.3750	641.7929	672.7723	703.7954	709.2207	687.1871	659.8456	642.4419	628.1573	593.7997	564.0916	552.5087	(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	75.1768	75.5306	75.8877	77.7252	78.1034	80.0511	80.0511	80.4524	79.2605	78.1034	77.3506	76.6122	
alpha	6.0118	6.0354	6.0592	6.1817	6.2069	6.3367	6.3367	6.3635	6.2840	6.2069	6.1567	6.1075	
util living area													
	0.9439	0.9007	0.8379	0.7092	0.5575	0.3907	0.2801	0.2992	0.4641	0.7172	0.8881	0.9507	(86)
MIT	20.5245	20.6792	20.8175	20.9432	20.9881	20.9990	20.9999	20.9999	20.9970	20.9489	20.7601	20.5083	(87)
Th 2	20.4041	20.4068	20.4094	20.4226	20.4253	20.4385	20.4385	20.4412	20.4332	20.4253	20.4200	20.4147	(88)
util rest of house													
	0.9352	0.8873	0.8182	0.6817	0.5249	0.3566	0.2444	0.2629	0.4267	0.6852	0.8714	0.9430	(89)
MIT 2	19.8583	20.0478	20.2136	20.3665	20.4150	20.4378	20.4385	20.4411	20.4310	20.3768	20.1590	19.8475	(90)
Living area fraction										fLA = Living area / (4) =		0.4171	(91)
MIT	20.1362	20.3112	20.4655	20.6070	20.6541	20.6719	20.6727	20.6742	20.6671	20.6155	20.4098	20.1231	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.9862	20.1612	20.3155	20.4570	20.5041	20.5219	20.5227	20.5242	20.5171	20.4655	20.2598	19.9731	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9283	0.8812	0.8149	0.6834	0.5294	0.3617	0.2498	0.2683	0.4322	0.6875	0.8664	0.9363	(94)
Useful gains	532.2842	565.5423	548.2670	480.9521	375.4780	248.5616	164.7965	172.3885	271.5011	408.2265	488.7018	517.3170	(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													
	701.8047	679.5896	612.3205	500.1117	379.1359	248.8157	164.8153	172.4178	272.3104	424.8436	572.2246	692.4726	(97)
Space heating kWh													
	126.1233	76.6398	47.6558	13.7949	2.7215	0.0000	0.0000	0.0000	0.0000	12.3631	60.1364	130.3157	(98a)
Space heating requirement - total per year (kWh/year)												469.7504	
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													
	126.1233	76.6398	47.6558	13.7949	2.7215	0.0000	0.0000	0.0000	0.0000	12.3631	60.1364	130.3157	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												469.7504	
Space heating per m2											(98c) / (4) =	6.6023	(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 %)	88.8000 (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													
	126.1233	76.6398	47.6558	13.7949	2.7215	0.0000	0.0000	0.0000	0.0000	12.3631	60.1364	130.3157	(98)
Space heating efficiency (main heating system 1)													
	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)													
	142.0307	86.3060	53.6664	15.5348	3.0647	0.0000	0.0000	0.0000	0.0000	13.9224	67.7212	146.7520	(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													
	227.3935	200.9935	213.3886	191.7240	185.9035	164.0207	156.7982	169.8363	170.2225	192.3398	205.2295	226.8324	(64)
Efficiency of water heater												79.8000	(216)
(217)m	82.7937	82.0969	81.3043	80.3466	79.9169	79.8000	79.8000	79.8000	79.8000	80.2915	81.6759	82.8644	(217)
Fuel for water heating, kWh/month													
	274.6506	244.8247	262.4566	238.6212	232.6212	205.5397	196.4890	212.8274	213.3114	239.5520	251.2730	273.7392	(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	23.0440	20.8139	23.0440	22.3006	23.0440	22.3006	23.0440	23.0440	22.3006	23.0440	22.3006	23.0440	(231)
Lighting	21.8260	17.5097	15.7655	11.5505	8.9219	7.2893	8.1389	10.5792	13.7414	18.0294	20.3642	22.4327	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year

Space heating fuel - main system 1	528.9982	(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	2845.9059	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	185.3244	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	271.3244	(231)
Electricity for lighting (calculated in Appendix L)	176.1486	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3822.3772	(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	528.9982	0.2100	111.0896	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2845.9059	0.2100	597.6402	(264)
Space and water heating			708.7299	(265)
Pumps, fans and electric keep-hot	271.3244	0.1387	37.6360	(267)
Energy for lighting	176.1486	0.1443	25.4237	(268)
Total CO2, kg/year			771.7896	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.8500	(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	528.9982	1.1300	597.7680	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2845.9059	1.1300	3215.8736	(278)
Space and water heating			3813.6416	(279)
Pumps, fans and electric keep-hot	271.3244	1.5128	410.4596	(281)
Energy for lighting	176.1486	1.5338	270.1827	(282)
Total Primary energy kWh/year			4494.2839	(286)
Dwelling Primary energy Rate (DPER)			63.1700	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.1500	(1b) x	2.8000	(2b) =	199.2200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.1500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	199.2200	(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) =	0.1506	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4006	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3405	(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	0.4341	0.4256	0.4171	0.3745	0.3660	0.3235	0.3235	0.3150	0.3405	0.3660	0.3831	0.4001	(22b)
Effective ac	0.5942	0.5906	0.5870	0.5701	0.5670	0.5523	0.5523	0.5496	0.5580	0.5670	0.5734	0.5800	(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			13.0900	1.1450	14.9885			(27)
External Wall 1	42.8400	13.0900	29.7500	0.1800	5.3550			(29a)
Corridor wall	12.0400	2.4200	9.6200	0.1800	1.7316			(29a)
Total net area of external elements Aum(A, m2)			54.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.4951			(33)
Main dwelling								
Party Wall 1			40.5400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 170.1805 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	8.2500	0.0500	0.4125
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	18.6000	0.0500	0.9300
E7 Party floor between dwellings (in blocks of flats)	21.8800	0.0700	1.5316
E7 Party floor between dwellings (in blocks of flats)	8.6000	0.0700	0.6020
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
E18 Party wall between dwellings	2.8000	0.0600	0.1680
E25 Staggered party wall between dwellings	2.8000	0.0600	0.1680
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	28.9600	0.0000	0.0000
E16 Corner (normal)	2.8000	0.0900	0.2520

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.0645 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 29.5596 (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	39.0667	38.8261	38.5903	37.4827	37.2755	36.3108	36.3108	36.1322	36.6824	37.2755	37.6947	38.1330	(38)
Heat transfer coeff	68.6264	68.3858	68.1500	67.0424	66.8351	65.8705	65.8705	65.6918	66.2420	66.8351	67.2544	67.6926	(39)

Average = Sum(39)m / 12 = 67.0414

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9645	0.9611	0.9578	0.9423	0.9394	0.9258	0.9258	0.9233	0.9310	0.9394	0.9452	0.9514	(40)
HLP (average)												0.9423	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2737 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.3424	61.4055	60.0403	57.4282	55.5005	53.3508	52.1289	53.4838	54.9690	57.2772	59.9454	62.1036	(42a)
Hot water usage for baths	26.9325	26.5325	25.9693	24.9307	24.1530	23.2907	22.8250	23.3843	23.9933	24.9160	25.9759	26.8415	(42b)
Hot water usage for other uses	37.9151	36.5364	35.1577	33.7789	32.4002	31.0215	31.0215	32.4002	33.7789	35.1577	36.5364	37.9151	(42c)

Average daily hot water use (litres/day) 116.9166 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.1901	124.4745	121.1672	116.1378	112.0538	107.6630	105.9753	109.2683	112.7412	117.3508	122.4577	126.8602	(44)
Energy conte	201.4380	177.2500	186.2295	158.9869	150.8459	132.3842	128.1680	135.2970	139.0212	159.2439	174.4635	198.6323	(45)
Energy content (annual)										Total = Sum(45)m =		1941.9604	
Distribution loss (46)m = 0.15 x (45)m	30.2157	26.5875	27.9344	23.8480	22.6269	19.8576	19.2252	20.2945	20.8532	23.8866	26.1695	29.7949	(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	250.6806	221.7272	235.4722	206.6411	200.0886	180.0384	177.4107	184.5396	186.6754	208.4866	222.1176	247.8750	(62)
WWHRS	-28.5004	-25.2059	-26.3942	-21.8555	-20.3685	-17.4295	-16.3373	-17.3731	-18.0332	-21.2592	-24.0840	-27.9726	(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	222.1803	196.5213	209.0780	184.7856	179.7201	162.6090	161.0733	167.1665	168.6422	187.2275	198.0336	219.9024	(64)
								Total per year (kWh/year) = Sum(64)m =				2256.9398	(64)
12Total per year (kWh/year)												2257	(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	106.3723	94.5174	101.3155	90.9865	89.5504	82.1411	82.0100	84.3804	84.3479	92.3427	96.1325	105.4394	(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	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	102.6656	113.6655	102.6656	106.0878	102.6656	106.0878	102.6656	102.6656	106.0878	102.6656	106.0878	102.6656	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.9661	202.0411	196.8121	185.6802	171.6282	158.4213	149.5982	147.5232	152.7522	163.8841	177.9361	191.1430	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	(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)	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	(71)
Water heating gains (Table 5)													

	142.9735	140.6509	136.1767	126.3701	120.3634	114.0849	110.2285	113.4145	117.1499	124.1166	133.5173	141.7196	(72)
Total internal gains	505.7109	516.4633	495.7602	478.2439	454.7630	435.6997	419.5981	420.7091	433.0957	450.7721	477.6470	495.6340	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.9600	36.7938	0.6300	0.7000	0.7700	67.0183	(77)
Southwest	7.1300	36.7938	0.6300	0.7000	0.7700	80.1745	(79)

Solar gains	147.1928	250.7238	343.0512	425.0570	476.0993	472.6564	455.6912	417.6114	371.4519	277.1032	176.3030	125.9663	(83)
Total gains	652.9037	767.1870	838.8114	903.3010	930.8623	908.3561	875.2893	838.3205	804.5475	727.8752	653.9500	621.6004	(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	49.0107	49.1831	49.3533	50.1687	50.3242	51.0612	51.0612	51.2001	50.7748	50.3242	50.0106	49.6868	
alpha	4.2674	4.2789	4.2902	4.3446	4.3549	4.4041	4.4041	4.4133	4.3850	4.3549	4.3340	4.3125	
util living area	0.9589	0.9241	0.8709	0.7668	0.6245	0.4555	0.3294	0.3579	0.5465	0.7940	0.9250	0.9651	(86)
MIT	19.9024	20.1718	20.4553	20.7483	20.9146	20.9834	20.9968	20.9954	20.9630	20.7512	20.3002	19.8620	(87)
Th 2	20.1130	20.1158	20.1186	20.1317	20.1342	20.1456	20.1456	20.1478	20.1412	20.1342	20.1292	20.1240	(88)
util rest of house	0.9511	0.9109	0.8496	0.7325	0.5767	0.3978	0.2662	0.2927	0.4854	0.7555	0.9097	0.9583	(89)
MIT 2	18.8557	19.1894	19.5340	19.8828	20.0610	20.1347	20.1442	20.1456	20.1149	19.8963	19.3633	18.8136	(90)
Living area fraction									fLA = Living area / (4) =			0.4171	(91)
MIT	19.2923	19.5992	19.9183	20.2439	20.4171	20.4887	20.4999	20.5001	20.4687	20.2529	19.7541	19.2509	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2923	19.5992	19.9183	20.2439	20.4171	20.4887	20.4999	20.5001	20.4687	20.2529	19.7541	19.2509	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9423	0.9019	0.8442	0.7371	0.5928	0.4212	0.2925	0.3198	0.5092	0.7612	0.9020	0.9501	(94)
Useful gains	615.2092	691.9590	708.1601	665.8476	551.7781	382.6001	256.0656	268.1226	409.6659	554.0446	589.8792	590.5769	(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	1028.8689	1005.2180	914.4597	760.5189	582.6064	387.8936	256.8872	269.3435	421.8752	645.1526	851.0449	1018.8375	(97)
Space heating kWh	307.7628	210.5101	153.4869	68.1633	22.9362	0.0000	0.0000	0.0000	0.0000	67.7843	188.0393	318.6258	(98a)
Space heating requirement - total per year (kWh/year)												1337.3087	
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	307.7628	210.5101	153.4869	68.1633	22.9362	0.0000	0.0000	0.0000	0.0000	67.7843	188.0393	318.6258	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1337.3087	
Space heating per m2										(98c) / (4) =		18.7956	(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	307.7628	210.5101	153.4869	68.1633	22.9362	0.0000	0.0000	0.0000	0.0000	67.7843	188.0393	318.6258	(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)	333.4375	228.0716	166.2914	73.8497	24.8496	0.0000	0.0000	0.0000	0.0000	73.4391	203.7262	345.2068	(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	222.1803	196.5213	209.0780	184.7856	179.7201	162.6090	161.0733	167.1665	168.6422	187.2275	198.0336	219.9024	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.7907	84.2143	83.3774	82.0407	80.7260	79.8000	79.8000	79.8000	79.8000	82.0093	83.9438	84.8905	(217)
Fuel for water heating, kWh/month	262.0337	233.3586	250.7611	225.2366	222.6298	203.7706	201.8463	209.4818	211.3311	228.3002	235.9122	259.0424	(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	21.3319	17.1132	15.4086	11.2890	8.7199	7.1243	7.9546	10.3397	13.4303	17.6212	19.9031	21.9248	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.7697	-23.6506	-36.1379	-43.2770	-49.0155	-46.6173	-46.0514	-42.3016	-36.1145	-28.1826	-17.8337	-13.4737	(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	-5.0658	-10.9431	-22.2960	-34.3053	-46.1739	-46.6936	-46.1432	-38.6925	-27.8719	-15.9116	-6.8462	-3.9848	(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	1448.8718	(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	2743.7044	(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)	172.1606	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-703.3534	(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	3747.3834	(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	1448.8718	0.2100	304.2631	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2743.7044	0.2100	576.1779	(264)
Space and water heating			880.4410	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	172.1606	0.1443	24.8481	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-398.4256	0.1333	-53.1138	
PV Unit electricity exported	-304.9279	0.1252	-38.1759	
Total			-91.2896	(269)
Total CO2, kg/year			825.9287	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.6100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1448.8718	1.1300	1637.2252	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2743.7044	1.1300	3100.3860	(278)
Space and water heating			4737.6112	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	172.1606	1.5338	264.0656	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-398.4256	1.4926	-594.6961	
PV Unit electricity exported	-304.9279	0.4595	-140.1213	
Total			-734.8174	(283)
Total Primary energy kWh/year			4396.9602	(286)
Target Primary Energy Rate (TPER)			61.8000	(287)

Full SAP Calculation Printout

Plot Reference	A 204	Issued on Date	15/05/2026
Assessment Reference	Be Lean 260515	Plot Type Ref	
Plot Address		SAP Version	10.2

SAP Rating	86 B	DER	10.85	TER	11.61
Environmental	91 B	% DER < TER			6.55
CO_2 Emissions (t/year)	0.72	DFEE	26.07	TFEE	25.91
Compliance Check	See BREL	% DFEE < TFEE			-0.63
% DPER < TPER	-2.21	DPER	63.17	TPER	61.80

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	71.1500 (1b)	x	2.8000 (2b)	=	199.2200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.1500					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	199.2200	(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) =	0.1506	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3006	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2555	(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	0.3258	0.3194	0.3130	0.2810	0.2747	0.2427	0.2427	0.2363	0.2555	0.2747	0.2874	0.3002	(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	0.5531	0.5510	0.5490	0.5395	0.5377	0.5295	0.5295	0.5279	0.5326	0.5377	0.5413	0.5451	(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			13.0900	1.1450	14.9885			(27)
External Wall 1	42.8400	13.0900	29.7500	0.1500	4.4625	70.0000	2082.5000	(29a)
Corridor wall	12.0400	2.4200	9.6200	0.1800	1.7316	70.0000	673.4000	(29a)
Total net area of external elements Aum(A, m2)			54.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.6026			(33)
Main dwelling								
Party Wall 1			40.5400	0.0000	0.0000	70.0000	2837.8000	(32)
Party Floor 1			71.1500			40.0000	2846.0000	(32d)
Party Ceiling 1			71.1500			30.0000	2134.5000	(32b)
Internal Wall 1			170.4600			9.0000	1534.1400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12108.3400	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	170.1805	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	8.2500	0.0500	0.4125
E3 Sill	4.7600	0.0400	0.1904

E4 Jamb	18.6000	0.0400	0.7440	
E7 Party floor between dwellings (in blocks of flats)	21.8800	0.0500	1.0940	
E7 Party floor between dwellings (in blocks of flats)	8.6000	0.0360	0.3096	
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	
E18 Party wall between dwellings	2.8000	0.0360	0.1008	
E25 Staggered party wall between dwellings	2.8000	0.0360	0.1008	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	28.9600	0.0000	0.0000	
E16 Corner (normal)	2.8000	0.0360	0.1008	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.9089 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.5115 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.3596	36.2242	36.0914	35.4678	35.3511	34.8079	34.8079	34.7073	35.0171	35.3511	35.5871	35.8339	(38)
Heat transfer coeff													
	63.8712	63.7357	63.6029	62.9793	62.8626	62.3195	62.3195	62.2189	62.5287	62.8626	63.0987	63.3454	(39)

Average = Sum(39)m / 12 = 62.9787

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8977	0.8958	0.8939	0.8852	0.8835	0.8759	0.8759	0.8745	0.8788	0.8835	0.8868	0.8903	(40)
HLP (average)												0.8852	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2737 (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													
	26.3321	25.9346	25.3691	24.5223	23.7591	22.7084	21.9114	22.8861	23.3976	24.4386	25.5209	26.3112	(42b)
Hot water usage for other uses													
	37.9151	36.5364	35.1577	33.7789	32.4002	31.0215	31.0215	32.4002	33.7789	35.1577	36.5364	37.9151	(42c)

Average daily hot water use (litres/day) 58.8844 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	64.2473	62.4710	60.5268	58.3012	56.1593	53.7299	52.9328	55.2863	57.1765	59.5963	62.0573	64.2264	(44)
Energy conte	94.5831	82.6618	86.4916	76.1560	72.3669	62.1369	58.4924	65.0729	66.3219	76.7958	83.8726	94.3211	(45)

Energy content (annual) Total = Sum(45)m = 919.2729

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													
	80.3956	70.2625	73.5178	64.7326	61.5119	52.8163	49.7185	55.3120	56.3736	65.2765	71.2917	80.1730	(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													
	80.3956	70.2625	73.5178	64.7326	61.5119	52.8163	49.7185	55.3120	56.3736	65.2765	71.2917	80.1730	(64)

Total per year (kWh/year) = Sum(64)m = 781.3820 (64)

12Total per year (kWh/year) 781 (64)

Electric shower(s)													
	49.9259	44.4844	48.5752	46.3548	47.2246	45.0477	46.5493	47.2246	46.3548	48.5752	47.6618	49.9259	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 567.9040 (64a)

Heat gains from water heating, kWh/month													
	32.5804	28.6867	30.5233	27.7718	27.1841	24.4660	24.0669	25.6341	25.6821	28.4629	29.7384	32.5247	(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	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	102.6656	113.6655	102.6656	106.0878	102.6656	106.0878	102.6656	102.6656	106.0878	102.6656	106.0878	102.6656	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	199.9661	202.0411	196.8121	185.6802	171.6282	158.4213	149.5982	147.5232	152.7522	163.8841	177.9361	191.1430	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	(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)													
	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	(71)
Water heating gains (Table 5)													
	43.7908	42.6886	41.0259	38.5720	36.5378	33.9806	32.3480	34.4545	35.6696	38.2566	41.3033	43.7160	(72)
Total internal gains													
	403.5283	415.5010	397.6094	387.4458	367.9374	355.5954	341.7177	341.7491	351.6154	361.9121	382.4330	394.6304	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.9600	36.7938	0.3500	0.7000	0.7700	37.2324	(77)
Southwest	7.1300	36.7938	0.3500	0.7000	0.7700	44.5414	(79)

Solar gains	81.7738	139.2910	190.5840	236.1428	264.4996	262.5869	253.1618	232.0063	206.3622	153.9462	97.9461	69.9813	(83)
Total gains	485.3020	554.7919	588.1934	623.5886	632.4370	618.1823	594.8794	573.7554	557.9775	515.8583	480.3791	464.6117	(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	52.6596	52.7715	52.8816	53.4053	53.5044	53.9707	53.9707	54.0580	53.7902	53.5044	53.3043	53.0966	
alpha	4.5106	4.5181	4.5254	4.5604	4.5670	4.5980	4.5980	4.6039	4.5860	4.5670	4.5536	4.5398	
util living area	0.9842	0.9705	0.9484	0.8917	0.7867	0.6118	0.4538	0.4884	0.7025	0.9024	0.9698	0.9868	(86)
MIT	19.7352	19.9522	20.2167	20.5562	20.8123	20.9554	20.9908	20.9871	20.9148	20.5943	20.1145	19.6968	(87)
Th 2	20.1695	20.1711	20.1727	20.1801	20.1815	20.1880	20.1880	20.1893	20.1855	20.1815	20.1787	20.1757	(88)
util rest of house	0.9809	0.9645	0.9377	0.8692	0.7441	0.5450	0.3733	0.4069	0.6395	0.8776	0.9626	0.9840	(89)
MIT 2	19.0151	19.2296	19.4890	19.8173	20.0467	20.1636	20.1847	20.1842	20.1344	19.8591	19.3974	18.9821	(90)
Living area fraction										fLA = Living area / (4) =		0.4171	(91)
MIT	19.3155	19.5310	19.7925	20.1255	20.3661	20.4939	20.5210	20.5192	20.4599	20.1658	19.6965	19.2802	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3155	19.5310	19.7925	20.1255	20.3661	20.4939	20.5210	20.5192	20.4599	20.1658	19.6965	19.2802	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9766	0.9589	0.9319	0.8675	0.7543	0.5709	0.4067	0.4406	0.6617	0.8771	0.9575	0.9802	(94)
Useful gains	473.9355	531.9800	548.1458	540.9814	477.0692	352.9162	241.9277	252.7803	369.2143	452.4428	459.9435	455.3919	(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	959.0565	932.5186	845.4449	706.9770	544.7728	367.3048	244.3518	256.2889	397.6787	601.3299	794.8236	955.2648	(97)
Space heating kWh	360.9300	269.1620	221.1905	119.5168	50.3715	0.0000	0.0000	0.0000	0.0000	110.7720	241.1137	371.9055	(98a)
Space heating requirement - total per year (kWh/year)												1744.9619	
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	360.9300	269.1620	221.1905	119.5168	50.3715	0.0000	0.0000	0.0000	0.0000	110.7720	241.1137	371.9055	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1744.9619	
Space heating per m2											(98c) / (4) =	24.5251	(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	585.8030	461.1640	472.8635	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8780	0.9323	0.9186	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	514.3440	429.9358	434.3921	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	682.7232	657.6290	634.8216	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	121.2330	169.4038	149.1195	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	30.3083	42.3509	37.2799	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												109.9391	(107)
Energy for space heating												24.5251	(99)
Energy for space cooling												1.5452	(108)
Total												26.0703	(109)
Fabric Energy Efficiency (DFEE)												26.1	(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	71.1500	(1b)	x 2.8000	(2b) =	199.2200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.1500					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	199.2200	(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) =	0.1506	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4006	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3405	(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	0.4341	0.4256	0.4171	0.3745	0.3660	0.3235	0.3235	0.3150	0.3405	0.3660	0.3831	0.4001	(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	0.5942	0.5906	0.5870	0.5701	0.5670	0.5523	0.5523	0.5496	0.5580	0.5670	0.5734	0.5800	(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			13.0900	1.1450	14.9885			(27)
External Wall 1	42.8400	13.0900	29.7500	0.1800	5.3550			(29a)
Corridor wall	12.0400	2.4200	9.6200	0.1800	1.7316			(29a)
Total net area of external elements Aum(A, m2)			54.8800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.4951			(33)
Main dwelling								
Party Wall 1			40.5400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	170.1805	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	8.2500	0.0500	0.4125
E3 Sill	4.7600	0.0500	0.2380
E4 Jamb	18.6000	0.0500	0.9300
E7 Party floor between dwellings (in blocks of flats)	21.8800	0.0700	1.5316
E7 Party floor between dwellings (in blocks of flats)	8.6000	0.0700	0.6020
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
E18 Party wall between dwellings	2.8000	0.0600	0.1680
E25 Staggered party wall between dwellings	2.8000	0.0600	0.1680
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	28.9600	0.0000	0.0000
E16 Corner (normal)	2.8000	0.0900	0.2520

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.0645	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	29.5596	(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	39.0667	38.8261	38.5903	37.4827	37.2755	36.3108	36.3108	36.1322	36.6824	37.2755	37.6947	38.1330	(38)
Heat transfer coeff	68.6264	68.3858	68.1500	67.0424	66.8351	65.8705	65.8705	65.6918	66.2420	66.8351	67.2544	67.6926	(39)
Average = Sum(39)m / 12 =												67.0414	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9645	0.9611	0.9578	0.9423	0.9394	0.9258	0.9258	0.9233	0.9310	0.9394	0.9452	0.9514	(40)
HLP (average)												0.9423	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2737	(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	26.9325	26.5325	25.9693	24.9307	24.1530	23.2907	22.8250	23.3843	23.9933	24.9160	25.9759	26.8415	(42b)
Hot water usage for other uses	37.9151	36.5364	35.1577	33.7789	32.4002	31.0215	31.0215	32.4002	33.7789	35.1577	36.5364	37.9151	(42c)
Average daily hot water use (litres/day)												59.4390	(43)
Daily hot water use	64.8476	63.0689	61.1269	58.7096	56.5533	54.3122	53.8464	55.7845	57.7722	60.0737	62.5123	64.7566	(44)
Energy conte	102.7028	89.8093	93.9498	80.3706	76.1315	66.7832	65.1226	69.0729	71.2389	81.5194	89.0603	101.3932	(45)
Energy content (annual)										Total = Sum(45)m =		987.1545	
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	87.2974	76.3379	79.8573	68.3150	64.7118	56.7657	55.3542	58.7119	60.5531	69.2915	75.7012	86.1842	(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	87.2974	76.3379	79.8573	68.3150	64.7118	56.7657	55.3542	58.7119	60.5531	69.2915	75.7012	86.1842	(64)
								Total per year (kWh/year) = Sum(64)m =				839.0814	(64)
12Total per year (kWh/year)												839	(64)
Electric shower(s)	49.9259	44.4844	48.5752	46.3548	47.2246	45.0477	46.5493	47.2246	46.3548	48.5752	47.6618	49.9259	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						567.9040	(64a)
Heat gains from water heating, kWh/month	34.3058	30.2056	32.1081	28.6674	27.9841	25.4533	25.4759	26.4841	26.7270	29.4667	30.8408	34.0275	(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	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	113.6859	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	102.6656	113.6655	102.6656	106.0878	102.6656	106.0878	102.6656	102.6656	106.0878	102.6656	106.0878	102.6656	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	199.9661	202.0411	196.8121	185.6802	171.6282	158.4213	149.5982	147.5232	152.7522	163.8841	177.9361	191.1430	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	34.3686	(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)													
	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	-90.9487	(71)
Water heating gains (Table 5)													
	46.1100	44.9488	43.1561	39.8159	37.6130	35.3519	34.2418	35.5969	37.1208	39.6058	42.8344	45.7359	(72)
Total internal gains													
	405.8474	417.7611	399.7396	388.6897	369.0126	356.9667	343.6114	342.8915	353.0666	363.2612	383.9641	396.6503	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	5.9600	36.7938	0.6300	0.7000	0.7700	67.0183	(77)
Southwest	7.1300	36.7938	0.6300	0.7000	0.7700	80.1745	(79)

Solar gains	147.1928	250.7238	343.0512	425.0570	476.0993	472.6564	455.6912	417.6114	371.4519	277.1032	176.3030	125.9663	(83)
Total gains	553.0402	668.4849	742.7908	813.7467	845.1119	829.6231	799.3026	760.5029	724.5184	640.3644	560.2671	522.6167	(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	49.0107	49.1831	49.3533	50.1687	50.3242	51.0612	51.0612	51.2001	50.7748	50.3242	50.0106	49.6868	
alpha	4.2674	4.2789	4.2902	4.3446	4.3549	4.4041	4.4041	4.4133	4.3850	4.3549	4.3340	4.3125	
util living area													
	0.9764	0.9500	0.9063	0.8116	0.6722	0.4951	0.3599	0.3932	0.5971	0.8450	0.9534	0.9808	(86)
MIT	19.7208	20.0156	20.3341	20.6800	20.8864	20.9770	20.9955	20.9933	20.9480	20.6729	20.1501	19.6771	(87)
Th 2	20.1130	20.1158	20.1186	20.1317	20.1342	20.1456	20.1456	20.1478	20.1412	20.1342	20.1292	20.1240	(88)
util rest of house													
	0.9716	0.9404	0.8891	0.7801	0.6240	0.4336	0.2913	0.3222	0.5332	0.8112	0.9428	0.9768	(89)
MIT 2	18.9566	19.2457	19.5526	19.8808	20.0570	20.1337	20.1441	20.1453	20.1118	19.8841	19.3910	18.9223	(90)
Living area fraction										fLA = Living area / (4) =		0.4171	(91)
MIT	19.2754	19.5669	19.8786	20.2142	20.4030	20.4855	20.4992	20.4991	20.4606	20.2131	19.7077	19.2372	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2754	19.5669	19.8786	20.2142	20.4030	20.4855	20.4992	20.4991	20.4606	20.2131	19.7077	19.2372	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9659	0.9334	0.8838	0.7833	0.6395	0.4584	0.3199	0.3517	0.5577	0.8146	0.9368	0.9717	(94)
Useful gains	534.1688	623.9728	656.4632	637.3832	540.4540	380.3180	255.6663	267.4882	404.0376	521.6443	524.8343	507.8412	(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													
	1027.7057	1003.0048	911.7501	758.5281	581.6658	387.6800	256.8435	269.2745	421.3390	642.4957	847.9201	1017.9058	(97)
Space heating kWh													
	367.1915	254.7094	189.9334	87.2244	30.6616	0.0000	0.0000	0.0000	0.0000	89.9134	232.6218	379.4880	(98a)
Space heating requirement - total per year (kWh/year)												1631.7435	
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													
	367.1915	254.7094	189.9334	87.2244	30.6616	0.0000	0.0000	0.0000	0.0000	89.9134	232.6218	379.4880	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1631.7435	
Space heating per m2											(98c) / (4) =	22.9339	(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	619.1823	487.4414	499.2578	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9373	0.9676	0.9587	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	580.3294	471.6443	478.6438	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	929.6303	896.2454	852.9050	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	251.4966	315.9032	278.4504	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	62.8742	78.9758	69.6126	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												211.4626	(107)
Energy for space heating												22.9339	(99)
Energy for space cooling												2.9721	(108)
Total												25.9059	(109)
Fabric Energy Efficiency (TFEE)												25.9	(109)