Summary for Input Data

Property Reference	24-3460-00-P04	**Issued on Date**	07/06/2024
Assessment Reference	Lean	**Prop Type Ref**	House
Property	P04, NW1 1NW		

SAP Rating	84 B	**DER**	12.31	**TER**	11.78
Environmental	89 B	**% DER < TER**			-4.50
CO_2 Emissions (t/year)	1.22	**DFEE**	41.32	**TFEE**	41.55
Compliance Check	See BREL	**% DFEE < TFEE**			0.56
% DPER < TPER	-14.97	**DPER**	71.03	**TPER**	61.78

Assessor Details	Mr. Stuart Searle	**Assessor ID**	L603-0001
Client			

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

Orientation	Southeast	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	House, Mid-Terrace	
Which Floor	0	
2.0 Number of Storeys	3	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	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
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	11.43 m	39.80 m²	2.49 m
1st Storey:	10.07 m	43.69 m²	3.08 m
2nd Storey:	13.24 m	33.00 m²	3.17 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	17.58	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
EWT1 - Brick	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	80.43	63.71	0.00	None	16.72	Enter Gross Area
EWT2 - Bay	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.11	14.00	9.15	6.14	0.00	None	3.01	Enter Gross Area
EWT3 - Entrance	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	11.80	8.71	0.00	None	3.09	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
PWT1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	133.13	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
IWT1	Other	9.00	225.90

Summary for Input Data

elmhurst energy

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
RT1 - Main	External Slope Roof	Plasterboard, insulated slope	0.10	9.00	35.32	35.32	None	0.00	Enter Gross Area	0.00
RT2 - Bay	External Flat Roof	Plasterboard, insulated flat roof	0.15	9.00	1.10	1.10	None	0.00	Enter Gross Area	0.00
RT3 - Terrace	External Flat Roof	Plasterboard, insulated flat roof	0.12	9.00	9.60	9.60	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Other	39.80
Internal Ceiling 2	+1	Other	33.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
FT1	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.11	None	0.00	110.00	39.80
FT2 - Upp Exposed	Exposed Floor - Timber	+1	Timber exposed floor, insulation between joists	0.18	None	0.00	20.00	3.89

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1		Other	30.00	39.80
Internal Floor 2		Other	30.00	33.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
External FED	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05		Air Filled	0.50	Wood	0.70	1.00
Windows / Glazed Doors	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.50	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
FED	External FED	EWT3 - Entrance	South East	3.09	0
K	Windows / Glazed Doors	EWT1 - Brick	South East	1.12	0
LR	Windows / Glazed Doors	EWT1 - Brick	North West	5.46	0
S-Bed	Windows / Glazed Doors	EWT2 - Bay	South East	1.65	0
S-Bed	Windows / Glazed Doors	EWT2 - Bay	North East	1.35	0
S-Bed	Windows / Glazed Doors	EWT1 - Brick	South East	1.27	0
D-Bed	Windows / Glazed Doors	EWT1 - Brick	North West	2.64	0
Land D	Windows / Glazed Doors	EWT1 - Brick	North West	2.14	0
S-Bed	Windows / Glazed Doors	EWT1 - Brick	North West	1.91	0
D-Bed	Windows / Glazed Doors	EWT1 - Brick	South East	2.18	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging — Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	13.12	0.03	0.03	Yes
E3 Sill	Independently assessed	11.65	0.03	0.03	Yes
E4 Jamb	Independently assessed	34.18	0.02	0.02	Yes
E5 Ground floor (normal)	Independently assessed	11.43	0.15	0.15	Yes
E20 Exposed floor (normal)	Table K1 - Default	5.27	0.32	0.32	No
E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	6.31	0.15	0.15	No
E11 Eaves (insulation at rafter level)	Independently assessed	2.15	0.02	0.02	No
E6 Intermediate floor within a dwelling	Independently assessed	13.62	0.05	0.05	No
E14 Flat roof	Table K1 - Default	2.97	0.16	0.16	No
E15 Flat roof with parapet	Table K1 - Default	4.47	0.30	0.30	No
E16 Corner (normal)	Independently assessed	14.39	0.09	0.09	No
E17 Corner (inverted – internal area greater than external area)	Table K1 - Default	5.57	0.00	-0.09	No
P1 Party wall - Ground floor	Independently assessed	16.57	0.16	0.16	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	27.05	0.00	0.00	No
P7 Party Wall - Exposed floor (normal)	Table K1 - Default	2.49	0.48	0.48	No
P5 Party wall - Roof (insulation at rafter level)	Table K1 - Default	5.24	0.48	0.48	No
E18 Party wall between dwellings	Independently assessed	34.94	0.05	0.05	No
E13 Gable (insulation at rafter level)	Table K1 - Default	11.73	0.25	0.25	No

Y-value	0.11	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	

Summary for Input Data

Test Method	Blower Door	
As Built AP_{50}	3.00	$m^3/(h.m^2)$ @ 50 Pa

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	500565	
Configuration	2	
Manufacturer SFP	0.61	
Duct Type	Rigid	
MVHR Efficiency	93.00	
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

21.0 Fixed Cooling System	No	

22.0 Lighting

No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
Lighting 1	80.00	3	240	12

24.0 Main Heating 1	Manufacturer	
Description	Gas boiler	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	114	
In Winter	88.80	
In Summer	79.80	
Model Name	Notional	
Manufacturer	Notional	
Controls SAP Code	2110	
Delayed Start Stat	No	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in unheated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	No	

Summary for Input Data

elmhurst energy

Combi boiler type	No Combi
Combi keep hot type	None

25.0 Main Heating 2	None

26.0 Heat Networks	None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	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
Summer Immersion	No
Cold Water Source	From mains
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

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	

28.3 Waste Water Heat Recovery System

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	200.00	L
Loss	1.58	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store	None

34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

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Compliance Check	See BREL	**% DFEE < TFEE**			0.56
% DPER < TPER	-14.97	**DPER**	71.03	**TPER**	61.78

Assessor Details	Mr. Stuart Searle	**Assessor ID**	L603-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	39.8000 (1b)	x	2.4900 (2b)	=	99.1020	(1b) - (3b)
First floor	43.6900 (1c)	x	3.0800 (2c)	=	134.5652	(1c) - (3c)
Second floor	33.0000 (1d)	x	3.1700 (2d)	=	104.6100	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	338.2772	(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) =	83.7000 (23c)

Effective ac	0.2441	0.2409	0.2377	0.2217	0.2186	0.2026	0.2026	0.1994	0.2090	0.2186	0.2249	0.2313	(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	
External FED			3.0900	1.0000	3.0900			(26a)
Windows / Glazed Doors (Uw = 1.20)			19.7200	1.1450	22.5802			(27)
FT1			39.8000	0.1100	4.3780	110.0000	4378.0000	(28a)
FT2 - Upp Exposed			3.8900	0.1800	0.7002	20.0000	77.8000	(28b)
EWT1 - Brick	80.4300	16.7200	63.7100	0.1400	8.9194	110.0000	7008.1000	(29a)
EWT2 - Bay	9.1500	3.0000	6.1500	0.1100	0.6765	14.0000	86.1000	(29a)
EWT3 - Entrance	11.8000	3.0900	8.7100	0.1400	1.2194	110.0000	958.1000	(29a)
RT1 - Main	35.3200		35.3200	0.1000	3.5320	9.0000	317.8800	(30)
RT2 - Bay	1.1000		1.1000	0.1500	0.1650	9.0000	9.9000	(30)
RT3 - Terrace	9.6000		9.6000	0.1200	1.1520	9.0000	86.4000	(30)
Total net area of external elements Aum(A, m2)			191.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.4127			(33)
PWT1			133.1300	0.0000	0.0000	110.0000	14644.3000	(32)

IWT1	225.9000	9.0000	2033.1000	(32c)
Internal Floor 1	39.8000	30.0000	1194.0000	(32d)
Internal Floor 2	33.0000	30.0000	990.0000	(32d)
Internal Ceiling 1	39.8000	30.0000	1194.0000	(32e)
Internal Ceiling 2	33.0000	30.0000	990.0000	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 33967.6800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 291.5931 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	13.1200	0.0300	0.3936
E3 Sill	11.6500	0.0300	0.3495
E4 Jamb	34.1800	0.0200	0.6836
E5 Ground floor (normal)	11.4300	0.1500	1.7145
E20 Exposed floor (normal)	5.2700	0.3200	1.6864
E24 Eaves (insulation at ceiling level - inverted)	6.3100	0.1500	0.9465
E11 Eaves (insulation at rafter level)	2.1500	0.0200	0.0430
E6 Intermediate floor within a dwelling	13.6200	0.0500	0.6810
E14 Flat roof	2.9700	0.1600	0.4752
E15 Flat roof with parapet	4.4700	0.3000	1.3410
E16 Corner (normal)	14.3900	0.0900	1.2951
E17 Corner (inverted - internal area greater than external area)	5.5700	0.0000	0.0000
P1 Party wall - Ground floor	16.5700	0.1600	2.6512
P2 Party wall - Intermediate floor within a dwelling	27.0500	0.0000	0.0000
P7 Party Wall - Exposed floor (normal)	2.4900	0.4800	1.1952
P5 Party wall - Roof (insulation at rafter level)	5.2400	0.4800	2.5152
E18 Party wall between dwellings	34.9400	0.0500	1.7470
E13 Gable (insulation at rafter level)	11.7300	0.2500	2.9325

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 20.6505 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 67.0632 (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	27.2451	26.8892	26.5334	24.7543	24.3985	22.6193	22.6193	22.2635	23.3310	24.3985	25.1101	25.8218	(38)
Heat transfer coeff	94.3082	93.9524	93.5966	91.8174	91.4616	89.6825	89.6825	89.3267	90.3941	91.4616	92.1733	92.8849	(39)

Average = Sum(39)m / 12 = 91.7285

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8096	0.8065	0.8035	0.7882	0.7851	0.7699	0.7699	0.7668	0.7760	0.7851	0.7913	0.7974	(40)
HLP (average)												0.7874	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8487 (42)
Hot water usage for mixer showers

71.9826	70.9009	69.3245	66.3085	64.0827	61.6006	60.1897	61.7541	63.4690	66.1341	69.2149	71.7068	(42a)

Hot water usage for baths

31.0781	30.6165	29.9666	28.7682	27.8708	26.8758	26.3383	26.9837	27.6865	28.7512	29.9743	30.9730	(42b)

Hot water usage for other uses

43.8032	42.2104	40.6175	39.0247	37.4318	35.8390	35.8390	37.4318	39.0247	40.6175	42.2104	43.8032	(42c)

Average daily hot water use (litres/day) 135.0010 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	146.8639	143.7278	139.9086	134.1013	129.3854	124.3154	122.3671	126.1697	130.1802	135.5028	141.3996	146.4831	(44)
Energy conte	232.5966	204.6664	215.0344	183.5780	174.1776	152.8602	147.9923	156.2245	160.5252	183.8760	201.4496	229.3571	(45)
Energy content (annual)										Total = Sum(45)m =		2242.3380	
Distribution loss (46)m = 0.15 x (45)m	34.8895	30.7000	32.2552	27.5367	26.1266	22.9290	22.1989	23.4337	24.0788	27.5814	30.2174	34.4036	(46)

Water storage loss:
Store volume 200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.5800 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8532 (55)
Total storage loss

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(56)

If cylinder contains dedicated solar storage

26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492	(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

282.3082	249.5672	264.7460	231.6860	223.8892	200.9682	197.7039	205.9361	208.6332	233.5876	249.5576	279.0687	(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

282.3082	249.5672	264.7460	231.6860	223.8892	200.9682	197.7039	205.9361	208.6332	233.5876	249.5576	279.0687	(64)

Total per year (kWh/year) = Sum(64)m = 2827.6520 (64)
12Total per year (kWh/year) 2828 (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

117.1076	103.9722	111.2682	99.5261	97.6833	89.3124	88.9767	91.7139	91.8610	100.9081	105.4684	116.0305	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.0661	161.7160	146.0661	150.9350	146.0661	150.9350	146.0661	146.0661	150.9350	146.0661	150.9350	146.0661	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	280.5706	283.4820	276.1453	260.5262	240.8099	222.2794	209.8999	206.9885	214.3252	229.9443	249.6605	268.1911	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	(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)	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	(71)
Water heating gains (Table 5)	157.4027	154.7206	149.5540	138.2307	131.2948	124.0450	119.5924	123.2714	127.5848	135.6291	146.4839	155.9550	(72)

Total internal gains

	649.7694	665.6486	637.4954	615.4219	583.9008	562.9895	541.2884	542.0560	558.5750	577.3695	612.8094	635.9422 (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	1.3500	11.2829	0.5000	0.7000	0.7700	3.6945	(75)
Southeast	6.2200	36.7938	0.5000	0.7000	0.7700	55.5094	(77)
Northwest	12.1500	11.2829	0.5000	0.7000	0.7700	33.2506	(81)

Solar gains	92.4546	169.7560	264.8634	382.8141	478.6524	497.1267	470.1546	395.3013	305.1809	196.4052	112.9740	77.6758 (83)
Total gains	742.2240	835.4046	902.3588	998.2360	1062.5533	1060.1161	1011.4430	937.3573	863.7559	773.7747	725.7834	713.6179 (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	100.0493	100.4282	100.8100	102.7633	103.1631	105.2097	105.2097	105.6288	104.3814	103.1631	102.3666	101.5823	
alpha	7.6700	7.6952	7.7207	7.8509	7.8775	8.0140	8.0140	8.0419	7.9588	7.8775	7.8244	7.7722	
util living area	0.9983	0.9953	0.9852	0.9284	0.7684	0.5396	0.3900	0.4380	0.7062	0.9563	0.9949	0.9988	(86)
MIT	20.2825	20.4136	20.5968	20.8409	20.9705	20.9983	20.9999	20.9997	20.9881	20.8175	20.5174	20.2691	(87)
Th 2	20.2450	20.2477	20.2503	20.2636	20.2662	20.2795	20.2795	20.2822	20.2742	20.2662	20.2609	20.2556	(88)
util rest of house	0.9977	0.9936	0.9798	0.9056	0.7185	0.4798	0.3262	0.3699	0.6389	0.9370	0.9927	0.9983	(89)
MIT 2	19.4024	19.5718	19.8051	20.1092	20.2440	20.2787	20.2795	20.2821	20.2673	20.0899	19.7154	19.3938	(90)
Living area fraction									fLA = Living area / (4) =			0.1509	(91)
MIT	19.5352	19.6988	19.9246	20.2196	20.3537	20.3873	20.3882	20.3904	20.3761	20.1997	19.8364	19.5259	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5352	19.6988	19.9246	20.2196	20.3537	20.3873	20.3882	20.3904	20.3761	20.1997	19.8364	19.5259	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9969	0.9920	0.9768	0.9041	0.7247	0.4888	0.3359	0.3802	0.6487	0.9349	0.9910	0.9977	(94)
Useful gains	739.9539	828.7093	881.4559	902.4755	770.0723	518.1517	339.6998	356.3565	560.2954	723.4365	719.2553	711.9529	(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	1436.8069	1390.3864	1256.4944	1039.3359	791.4796	519.0189	339.7358	356.4493	567.3190	878.0061	1173.9553	1423.5479	(97)
Space heating kWh	518.4587	377.4470	279.0287	98.5395	15.9270	0.0000	0.0000	0.0000	0.0000	114.9998	327.3840	529.4266	(98a)
Space heating requirement - total per year (kWh/year)												2261.2113	
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	518.4587	377.4470	279.0287	98.5395	15.9270	0.0000	0.0000	0.0000	0.0000	114.9998	327.3840	529.4266	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2261.2113	
Space heating per m2										(98c) / (4) =		19.4112	(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 %)	83.8000 (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	518.4587	377.4470	279.0287	98.5395	15.9270	0.0000	0.0000	0.0000	0.0000	114.9998	327.3840	529.4266	(98)
Space heating efficiency (main heating system 1)	83.8000	83.8000	83.8000	83.8000	83.8000	0.0000	0.0000	0.0000	0.0000	83.8000	83.8000	83.8000	(210)
Space heating fuel (main heating system)	618.6858	450.4141	332.9698	117.5889	19.0060	0.0000	0.0000	0.0000	0.0000	137.2312	390.6730	631.7740	(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	282.3082	249.5672	264.7460	231.6860	223.8892	200.9682	197.7039	205.9361	208.6332	233.5876	249.5576	279.0687	(64)
Efficiency of water heater												79.8000	(216)
(217)m	80.4042	79.9850	79.1778	77.2887	75.3408	74.8000	74.8000	74.8000	74.8000	77.5605	79.6695	80.4726	(217)
Fuel for water heating, kWh/month	351.1110	312.0175	334.3689	299.7671	297.1687	268.6741	264.3101	275.3156	278.9214	301.1683	313.2412	346.7871	(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	34.0306	30.7373	34.0306	32.9328	34.0306	32.9328	34.0306	34.0306	32.9328	34.0306	32.9328	34.0306	(231)
Lighting	40.5849	32.5587	29.3155	21.4778	16.5901	13.5542	15.1340	19.6718	25.5517	33.5252	37.8667	41.7129	(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	2698.3428	(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	3642.8509	(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)	314.6824	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	400.6824	(231)
Electricity for lighting (calculated in Appendix L)	327.5437	(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	7069.4198	(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	2698.3428	0.2100	566.6520	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3642.8509	0.2100	764.9987	(264)
Space and water heating			1331.6507	(265)
Pumps, fans and electric keep-hot	400.6824	0.1387	55.5796	(267)
Energy for lighting	327.5437	0.1443	47.2747	(268)
Total CO2, kg/year			1434.5049	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.3100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2698.3428	1.1300	3049.1274	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3642.8509	1.1300	4116.4215	(278)
Space and water heating			7165.5488	(279)
Pumps, fans and electric keep-hot	400.6824	1.5128	606.1523	(281)
Energy for lighting	327.5437	1.5338	502.3975	(282)
Total Primary energy kWh/year			8274.0986	(286)
Dwelling Primary energy Rate (DPER)			71.0300	(287)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		39.8000 (1b)	x	2.4900 (2b)	=	99.1020	(1b) - (3b)
First floor		43.6900 (1c)	x	3.0800 (2c)	=	134.5652	(1c) - (3c)
Second floor		33.0000 (1d)	x	3.1700 (2d)	=	104.6100	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.4900						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	338.2772	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1182	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	5.0000	(17)
Infiltration rate	0.3682	(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) =	0.3130	(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	0.3991	0.3913	0.3834	0.3443	0.3365	0.2974	0.2974	0.2895	0.3130	0.3365	0.3521	0.3678	(22b)
Effective ac	0.5796	0.5765	0.5735	0.5593	0.5566	0.5442	0.5442	0.5419	0.5490	0.5566	0.5620	0.5676	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Semi-glazed door			3.0900	1.0000	3.0900			(26a)
TER Opening Type (Uw = 1.20)			19.7200	1.1450	22.5802			(27)
FT1			39.8000	0.1300	5.1740			(28a)
FT2 - Upp Exposed			3.8900	0.1300	0.5057			(28b)
EWT1 - Brick	80.4300	16.7200	63.7100	0.1800	11.4678			(29a)
EWT2 - Bay	9.1500	3.0000	6.1500	0.1800	1.1070			(29a)
EWT3 - Entrance	11.8000	3.0900	8.7100	0.1800	1.5678			(29a)
RT1 - Main	35.3200		35.3200	0.1100	3.8852			(30)
RT2 - Bay	1.1000		1.1000	0.1100	0.1210			(30)
RT3 - Terrace	9.6000		9.6000	0.1100	1.0560			(30)
Total net area of external elements Aum(A, m2)			191.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.5547			(33)
PWT1			133.1300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 291.5931 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	13.1200	0.0500	0.6560
E3	Sill	11.6500	0.0500	0.5825
E4	Jamb	34.1800	0.0500	1.7090
E5	Ground floor (normal)	11.4300	0.1600	1.8288
E20	Exposed floor (normal)	5.2700	0.3200	1.6864
E24	Eaves (insulation at ceiling level - inverted)	6.3100	0.2400	1.5144
E11	Eaves (insulation at rafter level)	2.1500	0.0400	0.0860
E6	Intermediate floor within a dwelling	13.6200	0.0000	0.0000
E14	Flat roof	2.9700	0.0800	0.2376
E15	Flat roof with parapet	4.4700	0.5600	2.5032
E16	Corner (normal)	14.3900	0.0900	1.2951
E17	Corner (inverted - internal area greater than external area)	5.5700	-0.0900	-0.5013
P1	Party wall - Ground floor	16.5700	0.0800	1.3256
P2	Party wall - Intermediate floor within a dwelling	27.0500	0.0000	0.0000
P7	Party Wall - Exposed floor (normal)	2.4900	0.1600	0.3984
P5	Party wall - Roof (insulation at rafter level)	5.2400	0.0800	0.4192
E18	Party wall between dwellings	34.9400	0.0600	2.0964
E13	Gable (insulation at rafter level)	11.7300	0.0800	0.9384

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	16.7757	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	67.3304	(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	64.7055	64.3603	64.0220	62.4327	62.1353	60.7511	60.7511	60.4948	61.2843	62.1353	62.7369	63.3657	(38)
Heat transfer coeff	132.0359	131.6907	131.3523	129.7630	129.4657	128.0814	128.0814	127.8251	128.6146	129.4657	130.0672	130.6961	(39)
Average = Sum(39)m / 12 =												129.7616	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1335	1.1305	1.1276	1.1139	1.1114	1.0995	1.0995	1.0973	1.1041	1.1114	1.1166	1.1220	(40)
HLP (average)												1.1139	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8487	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	71.9826	70.9009	69.3245	66.3085	64.0827	61.6006	60.1897	61.7541	63.4690	66.1341	69.2149	71.7068	(42a)
Hot water usage for baths	31.0781	30.6165	29.9666	28.7682	27.8708	26.8758	26.3383	26.9837	27.6865	28.7512	29.9743	30.9730	(42b)
Hot water usage for other uses	43.8032	42.2104	40.6175	39.0247	37.4318	35.8390	35.8390	37.4318	39.0247	40.6175	42.2104	43.8032	(42c)
Average daily hot water use (litres/day)												135.0010	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	146.8639	143.7278	139.9086	134.1013	129.3854	124.3154	122.3671	126.1697	130.1802	135.5028	141.3996	146.4831	(44)
Energy conte	232.5966	204.6664	215.0344	183.5780	174.1776	152.8602	147.9923	156.2245	160.5252	183.8760	201.4496	229.3571	(45)
Energy content (annual)										Total = Sum(45)m =		2242.3380	
Distribution loss (46)m = 0.15 x (45)m	34.8895	30.7000	32.2552	27.5367	26.1266	22.9290	22.1989	23.4337	24.0788	27.5814	30.2174	34.4036	(46)

Water storage loss:		
Store volume	200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6525	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.8924	(55)

Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(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	283.5226	250.6642	265.9604	232.8613	225.1037	202.1435	198.9184	207.1505	209.8085	234.8021	250.7329	280.2832	(62)
WWHRS	-32.9074	-29.1036	-30.4756	-25.2350	-23.5181	-20.1246	-18.8636	-20.0596	-20.8217	-24.5465	-27.8082	-32.2981	(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	250.6152	221.5606	235.4848	207.6263	201.5855	182.0189	180.0548	187.0909	188.9867	210.2556	222.9247	247.9851	(64)
										Total per year (kWh/year) = Sum(64)m =		2536.1891	(64)
12Total per year (kWh/year)												2536	(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	118.0792	104.8498	112.2398	100.4663	98.6549	90.2527	89.9483	92.6855	92.8013	101.8796	106.4086	117.0021	(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	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.0661	161.7160	146.0661	150.9350	146.0661	150.9350	146.0661	146.0661	150.9350	146.0661	150.9350	146.0661	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	280.5706	283.4820	276.1453	260.5262	240.8099	222.2794	209.8999	206.9885	214.3252	229.9443	249.6605	268.1911	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	(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)	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	(71)
Water heating gains (Table 5)	158.7086	156.0265	150.8599	139.5366	132.6007	125.3509	120.8983	124.5773	128.8906	136.9350	147.7898	157.2609	(72)
Total internal gains	654.0753	669.9545	641.8013	619.7278	588.2067	564.2953	542.5943	543.3619	559.8808	581.6754	617.1153	640.2480	(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	1.3500	11.2829	0.6300	0.7000	0.7700	4.6551	(75)
Southeast	6.2200	36.7938	0.6300	0.7000	0.7700	69.9419	(77)
Northwest	12.1500	11.2829	0.6300	0.7000	0.7700	41.8958	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	116.4928	213.8926	333.7279	482.3457	603.1021	626.3796	592.3948	498.0796	384.5280	247.4706	142.3473	97.8715	(83)
Total gains	770.5681	883.8471	975.5292	1102.0735	1191.3088	1190.6750	1134.9891	1041.4415	944.4088	829.1460	759.4626	738.1195	(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	71.4614	71.6487	71.8333	72.7131	72.8801	73.6677	73.6677	73.8154	73.3623	72.8801	72.5430	72.1939	
alpha	5.7641	5.7766	5.7889	5.8475	5.8587	5.9112	5.9112	5.9210	5.8908	5.8587	5.8362	5.8129	
util living area	0.9985	0.9963	0.9897	0.9587	0.8587	0.6629	0.4925	0.5561	0.8270	0.9767	0.9963	0.9988	(86)
MIT	19.8294	19.9886	20.2335	20.5799	20.8518	20.9751	20.9963	20.9927	20.9128	20.5609	20.1404	19.8085	(87)
Th 2	19.9736	19.9760	19.9784	19.9895	19.9915	20.0012	20.0012	20.0030	19.9975	19.9915	19.9873	19.9829	(88)
util rest of house	0.9979	0.9948	0.9855	0.9414	0.8062	0.5709	0.3830	0.4403	0.7474	0.9636	0.9946	0.9984	(89)
MIT 2	18.6128	18.8181	19.1310	19.5680	19.8729	19.9886	20.0003	20.0009	19.9421	19.5537	19.0212	18.5931	(90)
Living area fraction										fLA = Living area / (4) =		0.1509	(91)
MIT	18.7964	18.9947	19.2974	19.7207	20.0206	20.1375	20.1506	20.1506	20.0886	19.7057	19.1901	18.7765	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7964	18.9947	19.2974	19.7207	20.0206	20.1375	20.1506	20.1506	20.0886	19.7057	19.1901	18.7765	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9968	0.9927	0.9816	0.9355	0.8080	0.5841	0.3996	0.4578	0.7556	0.9585	0.9926	0.9975	(94)
Useful gains	768.1337	877.4349	957.5383	1031.0365	962.5229	695.4522	453.5360	476.7856	713.5788	794.7760	753.8096	736.2903	(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	1914.0425	1856.1440	1680.9694	1404.1238	1077.2357	709.2506	454.7614	479.4155	770.2228	1178.8798	1572.5208	1905.0894	(97)
Space heating kWh	852.5562	657.6925	538.2327	268.6229	85.3463	0.0000	0.0000	0.0000	0.0000	285.7733	589.4721	869.5865	(98a)
Space heating requirement - total per year (kWh/year)												4147.2825	
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	852.5562	657.6925	538.2327	268.6229	85.3463	0.0000	0.0000	0.0000	0.0000	285.7733	589.4721	869.5865	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4147.2825	
Space heating per m2											(98c) / (4) =	35.6020	(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	852.5562	657.6925	538.2327	268.6229	85.3463	0.0000	0.0000	0.0000	0.0000	285.7733	589.4721	869.5865	(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)												
	923.6795	712.5596	583.1340	291.0324	92.4662	0.0000	0.0000	0.0000	0.0000	309.6135	638.6480	942.1306 (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												
	250.6152	221.5606	235.4848	207.6263	201.5855	182.0189	180.0548	187.0909	188.9867	210.2556	222.9247	247.9851 (64)
Efficiency of water heater												79.8000 (216)
(217)m	86.5817	86.3461	85.8530	84.6384	82.2805	79.8000	79.8000	79.8000	79.8000	84.7485	86.1343	86.6320 (217)
Fuel for water heating, kWh/month												
	289.4553	256.5960	274.2883	245.3097	244.9981	228.0939	225.6326	234.4498	236.8255	248.0935	258.8105	286.2513 (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	30.3496	24.3476	21.9223	16.0612	12.4062	10.1359	11.3173	14.7107	19.1077	25.0704	28.3169	31.1932 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-39.0349	-55.9870	-81.8383	-93.5922	-102.2178	-95.8175	-94.5828	-88.6298	-78.3764	-64.6799	-43.2323	-33.6328 (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	-19.2401	-40.7686	-81.5961	-123.3986	-164.0181	-165.1643	-163.2769	-137.9031	-100.5876	-58.6474	-25.7951	-15.1970 (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	4493.2638 (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	3028.8043 (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)	244.9390 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1967.2147 (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	5885.7925 (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	4493.2638	0.2100	943.5854	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3028.8043	0.2100	636.0489	(264)
Space and water heating			1579.6343	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	244.9390	0.1443	35.3523	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-871.6217	0.1342	-117.0102	
PV Unit electricity exported	-1095.5930	0.1257	-137.6998	
Total			-254.7100	(269)
Total CO2, kg/year			1372.2058	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7800	(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	4493.2638	1.1300	5077.3881	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3028.8043	1.1300	3422.5489	(278)
Space and water heating			8499.9370	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	244.9390	1.5338	375.6957	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-871.6217	1.4961	-1304.0552	
PV Unit electricity exported	-1095.5930	0.4613	-505.4412	
Total			-1809.4964	(283)
Total Primary energy kWh/year			7196.2371	(286)
Target Primary Energy Rate (TPER)			61.7800	(287)

Full SAP Calculation Printout

Property Reference	24-3460-00-P04	**Issued on Date**	07/06/2024
Assessment Reference	Lean	**Prop Type Ref**	House
Property	P04, NW1 1NW		

SAP Rating	84 B	**DER**	12.31	**TER**	11.78
Environmental	89 B	**% DER < TER**			-4.50
CO_2 Emissions (t/year)	1.22	**DFEE**	41.32	**TFEE**	41.55
Compliance Check	See BREL	**% DFEE < TFEE**			0.56
% DPER < TPER	-14.97	**DPER**	71.03	**TPER**	61.78

Assessor Details	Mr. Stuart Searle	**Assessor ID**	L603-0001
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)	
Ground floor	39.8000 (1b)	x	2.4900 (2b)	=	99.1020	(1b) - (3b)
First floor	43.6900 (1c)	x	3.0800 (2c)	=	134.5652	(1c) - (3c)
Second floor	33.0000 (1d)	x	3.1700 (2d)	=	104.6100	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	338.2772	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1182	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2682	(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) =	0.2280	(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	0.2907	0.2850	0.2793	0.2508	0.2451	0.2166	0.2166	0.2109	0.2280	0.2451	0.2565	0.2679	(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	0.5423	0.5406	0.5390	0.5315	0.5300	0.5235	0.5235	0.5222	0.5260	0.5300	0.5329	0.5359	(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	
External FED			3.0900	1.0000	3.0900			(26a)
Windows / Glazed Doors (Uw = 1.20)			19.7200	1.1450	22.5802			(27)
FT1			39.8000	0.1100	4.3780	110.0000	4378.0000	(28a)
FT2 - Upp Exposed			3.8900	0.1800	0.7002	20.0000	77.8000	(28b)
EWT1 - Brick	80.4300	16.7200	63.7100	0.1400	8.9194	110.0000	7008.1000	(29a)
EWT2 - Bay	9.1500	3.0000	6.1500	0.1100	0.6765	14.0000	86.1000	(29a)
EWT3 - Entrance	11.8000	3.0900	8.7100	0.1400	1.2194	110.0000	958.1000	(29a)
RT1 - Main	35.3200		35.3200	0.1000	3.5320	9.0000	317.8800	(30)
RT2 - Bay	1.1000		1.1000	0.1500	0.1650	9.0000	9.9000	(30)
RT3 - Terrace	9.6000		9.6000	0.1200	1.1520	9.0000	86.4000	(30)
Total net area of external elements Aum(A, m2)			191.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.4127			(33)
PWT1			133.1300	0.0000	0.0000	110.0000	14644.3000	(32)
IWT1			225.9000			9.0000	2033.1000	(32c)
Internal Floor 1			39.8000			30.0000	1194.0000	(32d)
Internal Floor 2			33.0000			30.0000	990.0000	(32d)

Internal Ceiling 1	39.8000		30.0000	1194.0000 (32e)
Internal Ceiling 2	33.0000		30.0000	990.0000 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 33967.6800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 291.5931 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	13.1200	0.0300	0.3936
E3 Sill	11.6500	0.0300	0.3495
E4 Jamb	34.1800	0.0200	0.6836
E5 Ground floor (normal)	11.4300	0.1500	1.7145
E20 Exposed floor (normal)	5.2700	0.3200	1.6864
E24 Eaves (insulation at ceiling level - inverted)	6.3100	0.1500	0.9465
E11 Eaves (insulation at rafter level)	2.1500	0.0200	0.0430
E6 Intermediate floor within a dwelling	13.6200	0.0500	0.6810
E14 Flat roof	2.9700	0.1600	0.4752
E15 Flat roof with parapet	4.4700	0.3000	1.3410
E16 Corner (normal)	14.3900	0.0900	1.2951
E17 Corner (inverted - internal area greater than external area)	5.5700	0.0000	0.0000
P1 Party wall - Ground floor	16.5700	0.1600	2.6512
P2 Party wall - Intermediate floor within a dwelling	27.0500	0.0000	0.0000
P7 Party Wall - Exposed floor (normal)	2.4900	0.4800	1.1952
P5 Party wall - Roof (insulation at rafter level)	5.2400	0.4800	2.5152
E18 Party wall between dwellings	34.9400	0.0500	1.7470
E13 Gable (insulation at rafter level)	11.7300	0.2500	2.9325

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 20.6505 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 67.0632 (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	60.5329	60.3497	60.1702	59.3269	59.1691	58.4346	58.4346	58.2986	58.7175	59.1691	59.4883	59.8220	(38)
Heat transfer coeff	127.5961	127.4129	127.2333	126.3900	126.2322	125.4977	125.4977	125.3617	125.7807	126.2322	126.5514	126.8851	(39)
Average = Sum(39)m / 12 =												126.3893	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0953	1.0938	1.0922	1.0850	1.0836	1.0773	1.0773	1.0762	1.0798	1.0836	1.0864	1.0892	(40)
HLP (average)												1.0850	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8487 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

31.0781	30.6165	29.9666	28.7682	27.8708	26.8758	26.3383	26.9837	27.6865	28.7512	29.9743	30.9730	(42b)

Hot water usage for other uses

43.8032	42.2104	40.6175	39.0247	37.4318	35.8390	35.8390	37.4318	39.0247	40.6175	42.2104	43.8032	(42c)

Average daily hot water use (litres/day) 68.6354 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	74.8813	72.8269	70.5841	67.7928	65.3026	62.7148	62.1773	64.4156	66.7112	69.3687	72.1847	74.7763	(44)
Energy conte	118.5937	103.7046	108.4851	92.8050	87.9099	77.1151	75.1981	79.7599	82.2615	94.1327	102.8403	117.0815	(45)
Energy content (annual)										Total = Sum(45)m =		1139.8875	
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:													
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													
	100.8046	88.1489	92.2124	78.8843	74.7234	65.5479	63.9184	67.7959	69.9223	80.0128	87.4142	99.5193	(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													
	100.8046	88.1489	92.2124	78.8843	74.7234	65.5479	63.9184	67.7959	69.9223	80.0128	87.4142	99.5193	(64)
										Total per year (kWh/year) = Sum(64)m =		968.9043	(64)
12Total per year (kWh/year)												969	(64)
Electric shower(s)													
	57.6461	51.3631	56.0866	53.5227	54.5271	52.0135	53.7473	54.5271	53.5227	56.0866	55.0319	57.6461	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		655.7208	(64a)
Heat gains from water heating, kWh/month													
	39.6127	34.8780	37.0747	33.1017	32.3126	29.3903	29.4164	30.5808	30.8613	34.0248	35.6115	39.2913	(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	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	146.0661	161.7160	146.0661	150.9350	146.0661	150.9350	146.0661	146.0661	150.9350	146.0661	150.9350	146.0661	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	280.5706	283.4820	276.1453	260.5262	240.8099	222.2794	209.8999	206.9885	214.3252	229.9443	249.6605	268.1911	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	(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)													
	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	(71)
Water heating gains (Table 5)													
	53.2429	51.9018	49.8316	45.9747	43.4309	40.8199	39.5382	41.1032	42.8629	45.7323	49.4605	52.8110	(72)
Total internal gains													
	545.6095	562.8299	537.7730	523.1658	496.0370	479.7643	461.2342	459.8877	473.8531	487.4727	515.7860	532.7981	(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	1.3500	11.2829	0.5000	0.7000	0.7700	3.6945	(75)
Southeast	6.2200	36.7938	0.5000	0.7000	0.7700	55.5094	(77)
Northwest	12.1500	11.2829	0.5000	0.7000	0.7700	33.2506	(81)

Solar gains	92.4546	169.7560	264.8634	382.8141	478.6524	497.1267	470.1546	395.3013	305.1809	196.4052	112.9740	77.6758	(83)
Total gains	638.0641	732.5858	802.6364	905.9799	974.6894	976.8910	931.3888	855.1890	779.0340	683.8779	628.7600	610.4739	(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	73.9479	74.0543	74.1588	74.6536	74.7469	75.1844	75.1844	75.2659	75.0152	74.7469	74.5584	74.3623	
alpha	5.9299	5.9370	5.9439	5.9769	5.9831	6.0123	6.0123	6.0177	6.0010	5.9831	5.9706	5.9575	
util living area	0.9995	0.9986	0.9960	0.9817	0.9233	0.7618	0.5822	0.6524	0.8991	0.9902	0.9986	0.9996	(86)
MIT	19.7749	19.9168	20.1418	20.4741	20.7747	20.9515	20.9918	20.9846	20.8622	20.4775	20.0705	19.7504	(87)
Th 2	20.0046	20.0059	20.0072	20.0131	20.0142	20.0194	20.0194	20.0204	20.0174	20.0142	20.0120	20.0096	(88)
util rest of house	0.9992	0.9980	0.9942	0.9729	0.8865	0.6702	0.4584	0.5251	0.8369	0.9841	0.9979	0.9994	(89)
MIT 2	18.8836	19.0264	19.2515	19.5832	19.8617	19.9985	20.0176	20.0164	19.9415	19.5906	19.1849	18.8632	(90)
Living area fraction									fLA = Living area / (4) =			0.1509	(91)
MIT	19.0181	19.1608	19.3858	19.7176	19.9995	20.1423	20.1646	20.1625	20.0804	19.7244	19.3186	18.9971	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0181	19.1608	19.3858	19.7176	19.9995	20.1423	20.1646	20.1625	20.0804	19.7244	19.3186	18.9971	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9989	0.9973	0.9926	0.9694	0.8858	0.6827	0.4772	0.5446	0.8417	0.9816	0.9972	0.9992	(94)
Useful gains	637.3647	730.5934	796.7242	878.2906	863.3848	666.9115	444.5046	465.6945	655.7316	671.2665	627.0249	609.9630	(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	1877.9770	1817.0045	1639.5085	1367.2372	1047.6675	695.5450	447.3499	471.6788	752.2205	1151.7951	1546.2766	1877.5313	(97)
Space heating kWh	923.0155	730.0683	627.0315	352.0415	137.1063	0.0000	0.0000	0.0000	0.0000	357.5132	661.8612	943.0708	(98a)
Space heating requirement - total per year (kWh/year)												4731.7084	
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	923.0155	730.0683	627.0315	352.0415	137.1063	0.0000	0.0000	0.0000	0.0000	357.5132	661.8612	943.0708	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4731.7084	
Space heating per m2											(98c) / (4) =	40.6190	(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	1179.6787	928.6832	952.7490	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8162	0.8971	0.8526	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	962.8246	833.1203	812.2834	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1078.3317	1028.0765	941.9458	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	83.1651	145.0474	96.4688	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	20.7913	36.2619	24.1172	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												81.1703	(107)
Energy for space heating												40.6190	(99)
Energy for space cooling												0.6968	(108)
Total												41.3158	(109)
Fabric Energy Efficiency (DFEE)												41.3	(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)	
Ground floor	39.8000	(1b)	x 2.4900	(2b) =	99.1020	(1b) - (3b)
First floor	43.6900	(1c)	x 3.0800	(2c) =	134.5652	(1c) - (3c)
Second floor	33.0000	(1d)	x 3.1700	(2d) =	104.6100	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		338.2772	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1182	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3682	(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) =	0.3130	(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	0.3991	0.3913	0.3834	0.3443	0.3365	0.2974	0.2974	0.2895	0.3130	0.3365	0.3521	0.3678	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5796	0.5765	0.5735	0.5593	0.5566	0.5442	0.5442	0.5419	0.5490	0.5566	0.5620	0.5676	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Semi-glazed door			3.0900	1.0000	3.0900			(26a)
TER Opening Type (Uw = 1.20)			19.7200	1.1450	22.5802			(27)
FT1			39.8000	0.1300	5.1740			(28a)
FT2 - Upp Exposed			3.8900	0.1300	0.5057			(28b)
EWT1 - Brick	80.4300	16.7200	63.7100	0.1800	11.4678			(29a)
EWT2 - Bay	9.1500	3.0000	6.1500	0.1800	1.1070			(29a)
EWT3 - Entrance	11.8000	3.0900	8.7100	0.1800	1.5678			(29a)
RT1 - Main	35.3200		35.3200	0.1100	3.8852			(30)
RT2 - Bay	1.1000		1.1000	0.1100	0.1210			(30)
RT3 - Terrace	9.6000		9.6000	0.1100	1.0560			(30)
Total net area of external elements Aum(A, m2)			191.0900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.5547			(33)
PWT1			133.1300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 291.5931 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	13.1200	0.0500	0.6560
E3	Sill	11.6500	0.0500	0.5825
E4	Jamb	34.1800	0.0500	1.7090
E5	Ground floor (normal)	11.4300	0.1600	1.8288
E20	Exposed floor (normal)	5.2700	0.3200	1.6864
E24	Eaves (insulation at ceiling level - inverted)	6.3100	0.2400	1.5144
E11	Eaves (insulation at rafter level)	2.1500	0.0400	0.0860
E6	Intermediate floor within a dwelling	13.6200	0.0000	0.0000
E14	Flat roof	2.9700	0.0800	0.2376
E15	Flat roof with parapet	4.4700	0.5600	2.5032
E16	Corner (normal)	14.3900	0.0900	1.2951
E17	Corner (inverted - internal area greater than external area)	5.5700	-0.0900	-0.5013
P1	Party wall - Ground floor	16.5700	0.0800	1.3256
P2	Party wall - Intermediate floor within a dwelling	27.0500	0.0000	0.0000
P7	Party Wall - Exposed floor (normal)	2.4900	0.1600	0.3984
P5	Party wall - Roof (insulation at rafter level)	5.2400	0.0800	0.4192
E18	Party wall between dwellings	34.9400	0.0600	2.0964
E13	Gable (insulation at rafter level)	11.7300	0.0800	0.9384

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.7757 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 67.3304 (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	64.7055	64.3603	64.0220	62.4327	62.1353	60.7511	60.7511	60.4948	61.2843	62.1353	62.7369	63.3657	(38)
Heat transfer coeff	132.0359	131.6907	131.3523	129.7630	129.4657	128.0814	128.0814	127.8251	128.6146	129.4657	130.0672	130.6961	(39)

Average = Sum(39)m / 12 = 129.7616

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1335	1.1305	1.1276	1.1139	1.1114	1.0995	1.0995	1.0973	1.1041	1.1114	1.1166	1.1220	(40)
HLP (average)												1.1139	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8487 (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	31.0781	30.6165	29.9666	28.7682	27.8708	26.8758	26.3383	26.9837	27.6865	28.7512	29.9743	30.9730	(42b)
Hot water usage for other uses	43.8032	42.2104	40.6175	39.0247	37.4318	35.8390	35.8390	37.4318	39.0247	40.6175	42.2104	43.8032	(42c)

Average daily hot water use (litres/day) 68.6354 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	74.8813	72.8269	70.5841	67.7928	65.3026	62.7148	62.1773	64.4156	66.7112	69.3687	72.1847	74.7763	(44)
Energy conte	118.5937	103.7046	108.4851	92.8050	87.9099	77.1151	75.1981	79.7599	82.2615	94.1327	102.8403	117.0815	(45)
Energy content (annual)										Total = Sum(45)m =		1139.8875	
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:													
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													
	100.8046	88.1489	92.2124	78.8843	74.7234	65.5479	63.9184	67.7959	69.9223	80.0128	87.4142	99.5193	(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													
	100.8046	88.1489	92.2124	78.8843	74.7234	65.5479	63.9184	67.7959	69.9223	80.0128	87.4142	99.5193	(64)
										Total per year (kWh/year) = Sum(64)m =		968.9043	(64)
12Total per year (kWh/year)												969	(64)
Electric shower(s)													
	57.6461	51.3631	56.0866	53.5227	54.5271	52.0135	53.7473	54.5271	53.5227	56.0866	55.0319	57.6461	(64a)
						Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =						655.7208	(64a)
Heat gains from water heating, kWh/month													
	39.6127	34.8780	37.0747	33.1017	32.3126	29.3903	29.4164	30.5808	30.8613	34.0248	35.6115	39.2913	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	142.4334	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	146.0661	161.7160	146.0661	150.9350	146.0661	150.9350	146.0661	146.0661	150.9350	146.0661	150.9350	146.0661	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	280.5706	283.4820	276.1453	260.5262	240.8099	222.2794	209.8999	206.9885	214.3252	229.9443	249.6605	268.1911	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	37.2433	(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)													
	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	-113.9467	(71)
Water heating gains (Table 5)													
	53.2429	51.9018	49.8316	45.9747	43.4309	40.8199	39.5382	41.1032	42.8629	45.7323	49.4605	52.8110	(72)
Total internal gains													
	545.6095	562.8299	537.7730	523.1658	496.0370	479.7643	461.2342	459.8877	473.8531	487.4727	515.7860	532.7981	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	1.3500	11.2829	0.6300	0.7000	0.7700	4.6551	(75)
Southeast	6.2200	36.7938	0.6300	0.7000	0.7700	69.9419	(77)
Northwest	12.1500	11.2829	0.6300	0.7000	0.7700	41.8958	(81)

Solar gains	116.4928	213.8926	333.7279	482.3457	603.1021	626.3796	592.3948	498.0796	384.5280	247.4706	142.3473	97.8715	(83)
Total gains	662.1023	776.7224	871.5009	1005.5116	1099.1391	1106.1440	1053.6290	957.9674	858.3810	734.9433	658.1333	630.6696	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.4614	71.6487	71.8333	72.7131	72.8801	73.6677	73.6677	73.8154	73.3623	72.8801	72.5430	72.1939	
alpha	5.7641	5.7766	5.7889	5.8475	5.8587	5.9112	5.9112	5.9210	5.8908	5.8587	5.8362	5.8129	
util living area													
	0.9993	0.9981	0.9941	0.9721	0.8901	0.7037	0.5286	0.6002	0.8687	0.9867	0.9983	0.9995	(86)
MIT	19.7415	19.9027	20.1526	20.5152	20.8153	20.9661	20.9946	20.9893	20.8839	20.4916	20.0589	19.7212	(87)
Th 2	19.9736	19.9760	19.9784	19.9895	19.9915	20.0012	20.0012	20.0030	19.9975	19.9915	19.9873	19.9829	(88)
util rest of house													
	0.9990	0.9973	0.9915	0.9595	0.8439	0.6102	0.4121	0.4775	0.7972	0.9786	0.9974	0.9993	(89)
MIT 2	18.8255	18.9883	19.2387	19.6015	19.8722	19.9874	20.0001	20.0005	19.9367	19.5851	19.1535	18.8126	(90)
Living area fraction										fLA = Living area / (4) =		0.1509	(91)
MIT	18.9637	19.1263	19.3766	19.7394	20.0145	20.1351	20.1502	20.1497	20.0796	19.7219	19.2901	18.9497	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9637	19.1263	19.3766	19.7394	20.0145	20.1351	20.1502	20.1497	20.0796	19.7219	19.2901	18.9497	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9986	0.9964	0.9894	0.9555	0.8451	0.6235	0.4299	0.4962	0.8040	0.9756	0.9965	0.9990	(94)
Useful gains	661.2041	773.9041	862.3050	960.7415	928.9247	689.7030	452.9083	475.3019	690.1722	717.0086	655.8538	630.0280	(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													
	1936.1360	1873.4664	1691.3680	1406.5567	1076.4415	708.9487	454.7131	479.3033	769.0660	1180.9733	1585.5359	1927.7336	(97)
Space heating kWh													
	948.5493	738.9059	616.8228	320.9870	109.7525	0.0000	0.0000	0.0000	0.0000	345.1897	669.3711	965.4930	(98a)
Space heating requirement - total per year (kWh/year)												4715.0714	
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													

	948.5493	738.9059	616.8228	320.9870	109.7525	0.0000	0.0000	0.0000	345.1897	669.3711	965.4930	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)											4715.0714	
Space heating per m2										(98c) / (4) =	40.4762	(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	1203.9656	947.8027	971.4708	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8641	0.9289	0.8907	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1040.3401	880.4099	865.3297	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1229.4066	1170.9546	1062.0763	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	136.1278	216.1653	146.3795	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	34.0320	54.0413	36.5949	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												124.6682	(107)
Energy for space heating												40.4762	(99)
Energy for space cooling												1.0702	(108)
Total												41.5464	(109)
Fabric Energy Efficiency (TFEE)												41.5	(109)