



Energy Statement

Project: RO 39/41 London Road, Enfield, EN2 6LX
Date: 26/09/2023

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1. Executive Summary

- The application involves the erection of a two storey block containing 3x flats
- Enfield Council planning policies (London Plan) requires a minimum of 35% improvement in CO₂ emissions compared against the baseline. Following the energy hierarchy; be lean, be clean, be green.
 - “Be lean” involves improvement to fabric and generates a total saving of 0.5 tonnes CO₂/year which is equivalent to 13%.
 - U Values specified
 - Floor = 0.12
 - Walls = 0.18
 - Roofs = 0.13
 - Openings = 1.20
 - “Be clean” involves connection to a heat network. Unfortunately, there are no existing or planned networks within the vicinity of this site.
 - “Be green” involves incorporating renewable and or low carbon technologies. This development will utilise MVHR, air source heat pumps and a solar photovoltaic array. This step generated a saving of 2.2 tonnes CO₂/year which is equivalent to 73%.
- The cumulative savings was 2.6 tonnes CO₂/year which is equivalent to 86%.
- A cash in-lieu contribution of £1,215 will be required.

2. Introduction

This Energy Assessment has been prepared by Energytest ltd in support of the planning application for the development of site to form 3 self contained flats on land to the rear of 39/41 London Road, Enfield, EN2 6LX.

This statement provides an initial assessment of the CO2 emissions of the dwelling using approved standard calculation methods (SAP 10 and the corresponding GLA Emission Reporting Spreadsheet), reviews the various option for renewable technologies and demonstrate how compliance with The London Plan will be met by implementing appropriate fabric efficiency measures and renewable and/or low energy technologies.

2.1 Development

The application site is not currently used for any purpose.

The proposal is to erect a block of 3, self contained flats with separate entrances. The block is two storeys.

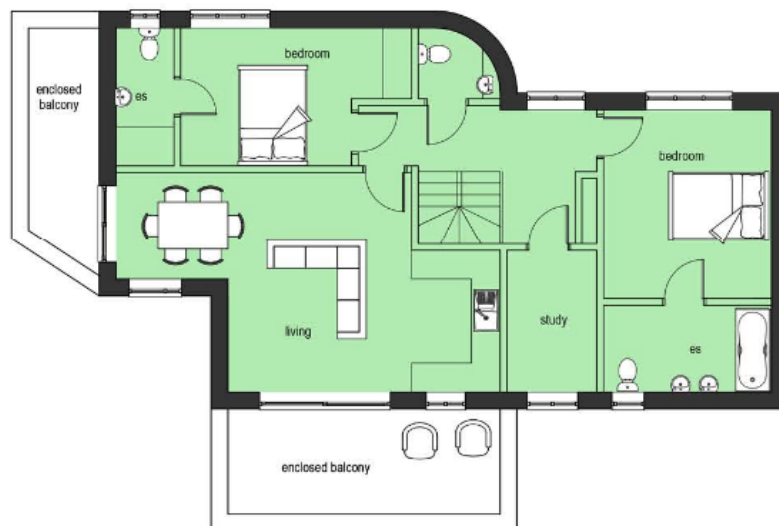
Flat 1 and 2 are located on the ground floor. Flat 3 is located on the first floor and is accessed by its own dedicated staircase. The flat statistics are as below:

Flat Number	Area (m ²)	Amenity space (m ²)
1	40m ² (studio)	27m ²
2	54m ² (1 bed, 2 person)	23m ²
3	96m ² (2 bed, 4 person)	18m ²

The project will be constructed to exceed the requirements of the 2021 version of Approved Document L1 of the Building Regulations



Ground Floor Plans



First Floor Plans

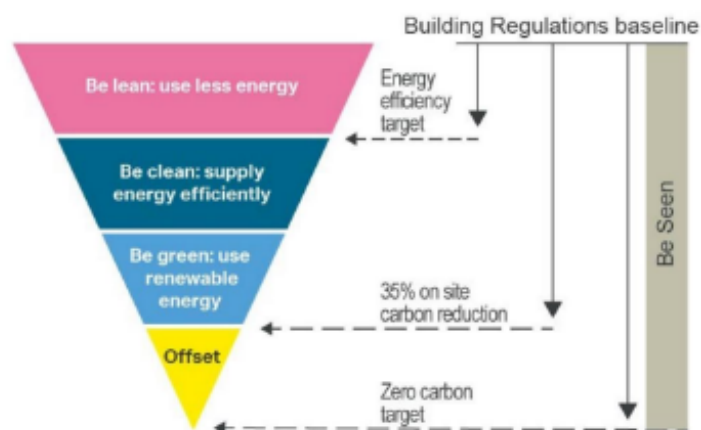
2.2 Planning Condition

Enfield Council are likely to set the following condition, to be inline with DMD 51 of the Enfield Development Management Document 2014, and The London Plan Policy SI 2.

Prior to the commencement of above ground construction works (not including demolition), an Energy Statement confirming the CO₂/yr (using SAP 10) reduction over Part L of Building Regulations (2021) shall be submitted to and approved in writing by the Local Planning Authority. The Energy Statement shall follow the GLA's Energy Assessment Guidance, the 'be lean, be clean, be green' reduction hierarchy set out in the London Plan (2021) and aspire to achieve a 35% reduction over Part L of Building Regulations (2021). This should include a detailed feasibility analysis of renewable energy technologies, including assessment of heat pumps as a feasible option for the building. The renewable energy technologies included in the Energy Statement shall be incorporated into the development and installed in accordance with the recommendations of Energy Statement prior to first occupation of the development and retained thereafter. Reason: In the interest of sustainable development and to ensure that the Local Planning Authority may be satisfied that CO₂ emission reduction targets are met in accordance with DMD 51 of the Enfield Development Management Document 2014.

- London Plan, policy SI 2, outlines how development is to make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

Figure 1: The London Plan energy hierarchy



1. **Be lean:** use less energy and manage demand during operation through fabric and servicing improvements and the incorporation of flexibility measures

2. **Be clean:** exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly by connecting to district heating networks
 3. **Be green:** maximise opportunities for renewable energy by producing, storing and using renewable energy on-site
 4. **Be seen:** monitor, verify and report on energy performance through the Mayor's post construction monitoring platform.
- Demonstrate how the net zero-carbon target for major residential and non-residential development will be met, with at least a 35 per cent on-site carbon reduction beyond Part L 2021.

Building Type	Min. on-site improvement over Part L 2021 (per cent)	Benchmark improvement over Part L 2021 (per cent)
Residential	35 per cent	50 per cent +

- Provide the value of the offset payment to make up any shortfall, where required.
- Commit that energy efficiency measures alone will reduce CO₂ emissions for residential uses by 10 per cent below those of a development compliant with Part L 2021 of the Building Regulations.

3. Establishing CO₂ Emissions

3.1 Baseline CO₂ Emissions

The baseline CO₂ emissions for this development have been calculated as per the minimum requirements of Part L Building Regulations, with heating and hot water to be provided via mains gas boilers.

The following Target Emission Rates (TER) were calculated:

Flat 1	17.98 kgCO ₂ /year/m ²
Flat 2	16.41 kgCO ₂ /year/m ²

Flat 3

14.68 kgCO₂/year/m²

3.2 Be Lean CO₂ Emissions

The first step of the energy hierarchy is to “Be lean: use less energy”. This involves improving the building fabric above and beyond the Building Regulations target to reduce the demand for energy in each individual unit.

The following specification / U Values have been used within the SAP calculations:

Element	U Value	Comments (example specification)
Ground Floor	0.12	Screed on 150mm PIR insulation on slab
Exposed Floors	0.16	100mm PIR insulation between joists, 50mm PIR insulation fixed under
Cavity Walls	0.18	Outer leaf, 100mm cavity with 90mm PIR “full fill” insulation, 100mm light aircrete block inner leaf, plasterboard on dabs
Party Walls	0.00	Fully filled cavity walls
Internal Walls	-	Timber studs
Flat Roof	0.13	160mm PIR insulation on a warm deck
Glazing	1.20	- Double glazed, UPVC frame - G Value of 0.40
Doors	1.20	- Double glazed, UPVC frame - G Value of 0.40

Thermal Bridging	<ul style="list-style-type: none"> - Insulated lintels (such as Catnic CG90/100) - Recognised Construction Details specified on all relevant junctions <ul style="list-style-type: none"> - https://www.recognisedconstructiondetails.co.uk/walls/masonry-cavity-wall-hybrid-insulation
Air tightness	A design air permeability rate of 4 has been set

This specification ensures the Dwelling Fabric Energy Efficiency (DFEE) exceeds the Target (TFEE):

Dwelling	TFEE (kWh/m ² /year)	DFEE (kWh/m ² /year)	% Variance
Flat 1	46.15	44.12	4.39%
Flat 2	47.92	47.10	1.70%
Flat 3	55.45	54.23	2.19%

The following Dwelling Emission Rates (DER) were calculated after the “be lean” step:

Flat 1	17.85 kgCO ₂ /year/m ²
Flat 2	17.21 kgCO ₂ /year/m ²
Flat 3	16.63 kgCO ₂ /year/m ²

3.3 Be Clean CO₂ Emissions

The second step in The London Plan energy hierarchy is to “be clean: supply energy efficiently.” This involves connecting to a District Energy Network.

There are no existing or proposed District Energy Network within the vicinity of the site, as indicated by the London Heat Map. <https://maps.london.gov.uk/heatmap>

The developers will make every effort so to supply energy efficiently within this development:

- Space heating via a highly efficient air source heat pump
- Hot water via an efficient cylinder with a low standing heat loss
- Ventilation via Mechanical Ventilation with Heat Recovery (MVHR)
 - A Zehnder Q350 has been specified for the purpose of this exercise
- Low energy lighting throughout
- Any appliances that are provided, will be efficient models

3.4 Be Green CO₂ Emissions

The final step in the London Plan energy hierarchy is to “be green: use renewable technology”.

After some feasibility study, the developers are going to implement the following renewable / low carbon technologies:

- **Air Source Heat Pump** for each dwelling
 - To provide space heating and domestic hot water
 - For the purpose of this exercise, a Mitsubishi Ecodan 6kW has been specified (actual make/model to be confirmed at a later date)
 - Due to the high efficiency of this technology, it is considered to be a low carbon technology.

- **Solar Photovoltaic (PV) Panels**
 - Solar panels harness the sun's energy to produce electricity
 - The drawings show 16x panels on the crown roof of each dwelling.
 - Based on 330W panels, this would equate to a total 5.28kWp
 - This has been split equally between the 3 dwellings - 1.76kWp each
 - The PV panels are currently specified to be South facing at 30 degrees
 - The PV can be distributed to each flat as it is deemed fit. However they are set up, will not affect the total figures in this statement, but will ultimately affect the EPC which is issued post construction

The following Dwelling Emission Rates (DER) were calculated after the “be green” step:

Flat 1	1.00 kgCO ₂ /year/m ²
Flat 2	1.68 kgCO ₂ /year/m ²
Flat 3	3.02 kgCO ₂ /year/m ²

3.5. Table 3: Regulated Carbon Dioxide Savings From Each Stage Of The Energy Hierarchy For Domestic Buildings

The following savings were calculated at each stage of the energy hierarchy:

	Regulated domestic carbon dioxide savings	
	Total tonnesCO ₂ /year	%
Be Lean	0.4	13%
Be Clean	-	-
Be Green	2.2	73%
Cumulative Savings	2.6	86%
Annual savings from off-set payment	0.4	
	(Tonnes CO₂)	
Cumulative savings for off-set payment	13	-
Cast in-lieu contribution (£)	1,215	

4. Conclusion

With the specification as outlined in this report, this development will achieve a cumulative saving of 2.6 tonnes CO₂ / year which is equivalent to a 86% improvement on the baseline.

A cash in-lieu payment of £1,215 will be required.

Therefore the 35% improvement over the baseline emissions as stipulated by London Plan policy SI 2, **is satisfied.**

Any revisions of the aforementioned specification must be communicated with Energytest to ensure the planning condition will remain in perpetuity.

5. Appendix

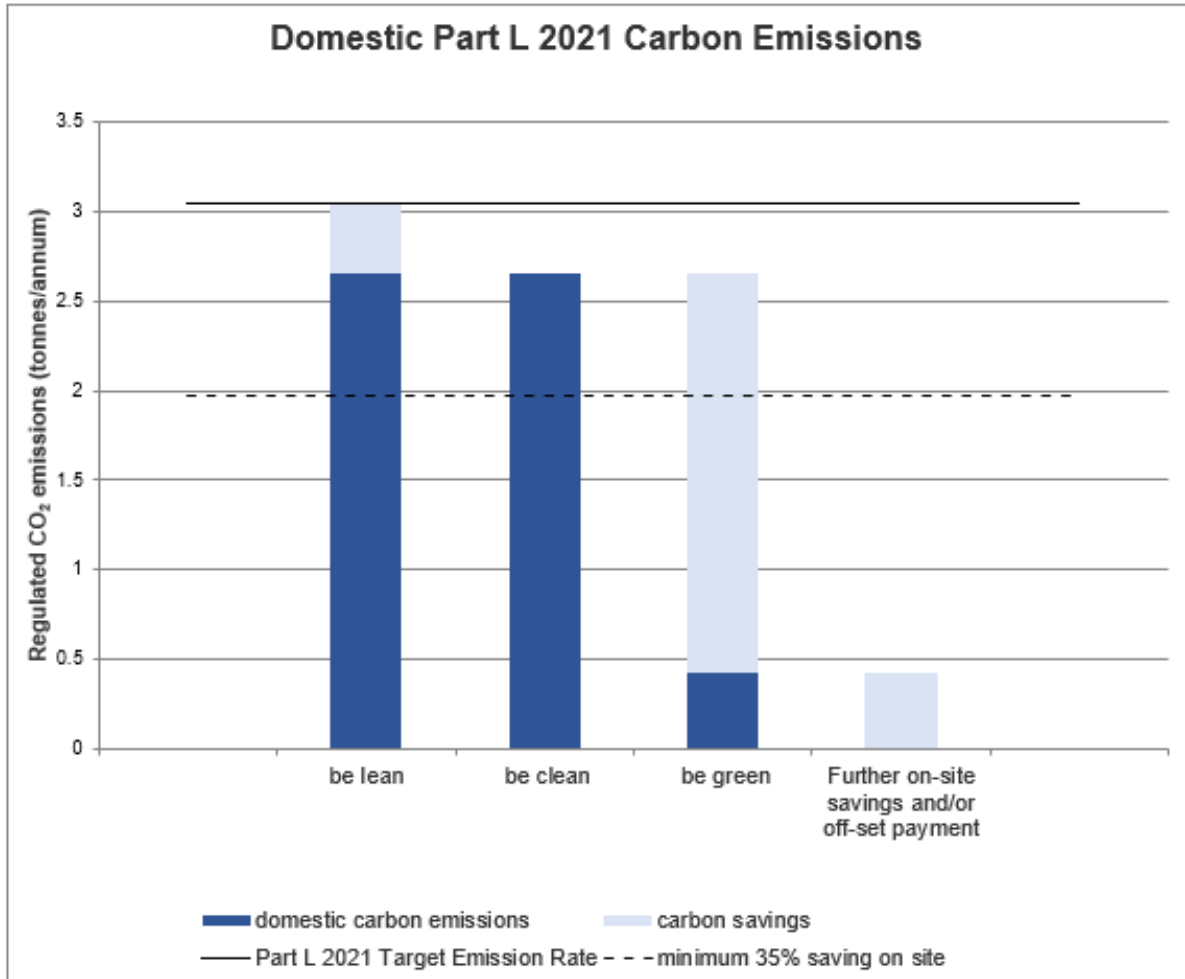
5.1 Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for residential buildings

	Carbon Dioxide Emissions for residential buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	3.0	
After energy demand reduction (be lean)	2.7	
After heat network connection (be clean)	2.7	
After renewable energy (be green)	0.4	

5.2 Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for residential buildings

	Regulated residential carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	0.4	13%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	2.2	73%
Cumulative on site savings	2.6	86%
Annual savings from off-set payment	0.4	-
	(Tonnes CO₂)	
Cumulative savings for off-set payment	13	-
Cash in-lieu contribution (£)	1,215	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development



Full SAP Calculation Printout



Property Reference	London Road 1		Issued on Date	26/09/2023	
Assessment Reference	01 Be Lean	Prop Type Ref			
Property	Flat 1, 39-41, London Road, Enfield, EN2 6LX				
SAP Rating	83 B	DER	17.85	TER	17.98
Environmental	89 B	% DER < TER			0.72
CO ₂ Emissions (t/year)	0.63	DFEE	44.12	TFEE	46.15
Compliance Check	See BREL	% DFEE < TFEE			4.39
% DPER < TPER	-6.79	DPER	101.63	TPER	95.17
Assessor Details	Mr. Thomas McMahon			Assessor ID	R863-0001
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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.8700	2.5000 (2b)	99.6750 (1b) - (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 99.6750 (5)

2. Ventilation rate

	m ³ 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)											
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	4.0000 (17)											
Infiltration rate	0.2000 (18)											
Number of sides sheltered	3 (19)											
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)											
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1550 (21)											
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821 (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) =	86.4000 (23c)											
Effective ac	0.2656	0.2617	0.2579	0.2385	0.2346	0.2152	0.2152	0.2114	0.2230	0.2346	0.2424	0.2501 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value KJ/m ² K	A x K kJ/K
Glazing (Uw = 1.20)			8.3300	1.1450	9.5382		(27)
Door			2.3300	1.2000	2.7960		(26)
Ground Floor			39.8700	0.1200	4.7844	110.0000	4385.7000 (28a)

Full SAP Calculation Printout



External Walls	41.0250	10.6600	30.3650	0.1800	5.4657	60.0000	1821.9000 (29a)
Flat Roof	7.3200		7.3200	0.1300	0.9516	9.0000	65.8800 (30)
Total net area of external elements Aum(A, m2)			88.2150				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.5359		(33)
Party Walls			22.1500	0.0000	0.0000	70.0000	1550.5000 (32)
Party Ceiling 1			32.5500			20.0000	651.0000 (32b)
Internal Walls			38.3000			9.0000	344.7000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 8819.6800 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 221.2109 (35)

List of Thermal Bridges				Length	Psi-value	Total
K1 Element				5.0700	0.2440	1.2371
E2 Other lintels (including other steel lintels)				0.6300	0.0210	0.0132
E3 Sill				15.9000	0.0160	0.2544
E4 Jamb				16.4100	0.0430	0.7056
E5 Ground floor (normal)				7.6200	0.3000	2.2860
E15 Flat roof with parapet				5.0000	0.0350	0.1750
E16 Corner (normal)				8.7900	0.1400	1.2306
E7 Party floor between dwellings (in blocks of flats)				8.8600	0.0360	0.3190
P1 Party wall - Ground floor				8.8600	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				2.5000	0.0550	0.1375
E18 Party wall between dwellings						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)						6.3584 (36)
Point Thermal bridges						0.0000 (36a) =
Total fabric heat loss						(33) + (36) + (36a) = 29.8943 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	8.7371	8.6097	8.4822	7.8449	7.7175	7.0802	7.0802	6.9527	7.3351	7.7175	7.9724	8.2273 (38)
Heat transfer coeff	38.6314	38.5039	38.3765	37.7392	37.6117	36.9744	36.9744	36.8470	37.2294	37.6117	37.8666	38.1216 (39)
Average = Sum(39)m / 12 =												37.7073
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9689	0.9657	0.9625	0.9466	0.9434	0.9274	0.9274	0.9242	0.9338	0.9434	0.9498	0.9561 (40)
HLP (average)												0.9458
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.4029 (42)
Hot water usage for mixer showers													
	47.7412	47.0237	45.9782	43.9779	42.5017	40.8555	39.9198	40.9573	42.0947	43.8622	45.9055	47.5583 (42a)	
Hot water usage for baths													
	20.6535	20.3468	19.9148	19.1184	18.5220	17.8608	17.5036	17.9325	18.3995	19.1071	19.9199	20.5837 (42b)	
Hot water usage for other uses													
	28.9969	27.9425	26.8881	25.8336	24.7792	23.7248	23.7248	24.7792	25.8336	26.8881	27.9425	28.9969 (42c)	
Average daily hot water use (litres/day)													89.5257 (43)
Daily hot water use													
	97.3916	95.3130	92.7811	88.9299	85.8030	82.4410	81.1481	83.6690	86.3279	89.8574	93.7680	97.1389 (44)	
Energy content (annual)													
	154.2445	135.7244	142.6011	121.7406	115.5073	101.3709	98.1416	103.5997	106.4509	121.9357	133.5897	152.0960 (45)	
Distribution loss (46)m = 0.15 x (45)m													
	23.1367	20.3587	21.3902	18.2611	17.3261	15.2056	14.7212	15.5400	15.9676	18.2904	20.0385	22.8144 (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 (59)
	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													30.9387 (61)
	30.9407	27.9414	30.9264	29.9129	30.8998	29.8932	30.8842	30.8899	29.8998	30.9082	29.9265	30.9387 (61)	
Total heat required for water heating calculated for each month													
	185.1852	163.6658	173.5275	151.6536	146.4071	131.2640	129.0258	134.4896	136.3507	152.8438	163.5162	183.0347 (62)	
WWHRS													0.0000 (63a)
	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 (63b)
	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 (63c)
	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 (63d)
	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													
	185.1852	163.6658	173.5275	151.6536	146.4071	131.2640	129.0258	134.4896	136.3507	152.8438	163.5162	183.0347 (64)	
Total per year (kWh/year) = Sum(64)m =													1850.9639 (64)
12Total per year (kWh/year)													1851 (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													
	59.0215	52.1137	55.1465	47.9570	46.1311	41.1791	40.3531	42.1694	42.8699	48.2707	51.9002	58.3066 (65)	

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	61.3251	67.8956	61.3251	63.3693	61.3251	63.3693	61.3251	61.3251	63.3693	61.3251	63.3693	61.3251 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	121.2066	122.4643	119.2949	112.5474	104.0300	96.0248	90.6769	89.4191	92.5886	99.3360	107.8535	115.8586 (68)

Full SAP Calculation Printout



Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154 (71)
Water heating gains (Table 5)	79.3299	77.5502	74.1216	66.6069	62.0042	57.1932	54.2381	56.6793	59.5415	64.8799	72.0836	78.3691	78.3691 (72)
Total internal gains	308.9049	314.9534	301.7848	289.5669	274.4025	260.6305	250.2833	251.4667	259.5426	272.5843	290.3496	302.5961	302.5961 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
North	0.8600	10.6334	0.4000	0.7000	0.7700	1.7744 (74)						
South	2.3400	46.7521	0.4000	0.7000	0.7700	21.2279 (78)						
West	5.1300	19.6403	0.4000	0.7000	0.7700	19.5504 (80)						
Solar gains	42.5528	76.4017	113.0315	151.1659	177.2011	178.7830	171.2188	151.7572	126.4422	86.9155	51.7284	35.8995 (83)
Total gains	351.4577	391.3551	414.8163	440.7327	451.6036	439.4135	421.5021	403.2239	385.9848	359.4998	342.0780	338.4956 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
tau	63.4176	63.6275	63.8389	64.9169	65.1369	66.2596	66.2596	66.4888	65.8059	65.1369	64.6984	64.2658
alpha	5.2278	5.2418	5.2559	5.3278	5.3425	5.4173	5.4173	5.4326	5.3871	5.3425	5.3132	5.2844
util living area	0.9805	0.9649	0.9354	0.8565	0.7189	0.5297	0.3846	0.4181	0.6387	0.8756	0.9620	0.9835 (86)
MIT	20.2489	20.3828	20.5527	20.7588	20.8839	20.9337	20.9414	20.9409	20.9184	20.7652	20.4858	20.2315 (87)
Th 2	20.1093	20.1120	20.1147	20.1281	20.1308	20.1443	20.1443	20.1470	20.1389	20.1308	20.1254	20.1200 (88)
util rest of house	0.9756	0.9564	0.9198	0.8250	0.6668	0.4625	0.3105	0.3417	0.5688	0.8411	0.9513	0.9793 (89)
MIT 2	19.2420	19.4112	19.6221	19.8749	20.0089	20.0656	20.0704	20.0730	20.0493	19.8898	19.5529	19.2290 (90)
Living area fraction	20.2047	20.3401	20.5119	20.7200	20.8455	20.8956	20.9032	20.9028	20.8803	20.7268	20.4448	20.1875 (92)
MIT	20.2047	20.3401	20.5119	20.7200	20.8455	20.8956	20.9032	20.9028	20.8803	20.7268	20.4448	20.1875 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2047	20.3401	20.5119	20.7200	20.8455	20.8956	20.9032	20.9028	20.8803	20.7268	20.4448	20.1875 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9762	0.9588	0.9272	0.8470	0.7101	0.5216	0.3763	0.4095	0.6294	0.8656	0.9556	0.9796 (94)
Useful gains	343.0888	375.2275	384.6233	373.2986	320.6886	229.2133	158.6015	165.1262	242.9310	311.1899	326.8810	331.5959 (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	614.4214	594.5058	537.7267	446.0756	343.9764	232.7768	159.1080	165.9131	252.4260	380.8858	505.3233	609.4687 (97)
Space heating kWh	201.8715	147.3550	113.9089	52.3995	17.3261	0.0000	0.0000	0.0000	0.0000	51.8537	128.4785	206.7373 (98a)
Space heating requirement - total per year (kWh/year)												919.9305
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	201.8715	147.3550	113.9089	52.3995	17.3261	0.0000	0.0000	0.0000	0.0000	51.8537	128.4785	206.7373 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												919.9305
Space heating per m2												(98c) / (4) = 23.0732 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fraction of space heat from main system(s)												0.0000 (201)
Efficiency of main space heating system 1 (in %)												1.0000 (202)
Efficiency of main space heating system 2 (in %)												83.7000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (207)
												0.0000 (208)
Space heating requirement	201.8715	147.3550	113.9089	52.3995	17.3261	0.0000	0.0000	0.0000	0.0000	51.8537	128.4785	206.7373 (98)
Space heating efficiency (main heating system 1)	83.7000	83.7000	83.7000	83.7000	83.7000	0.0000	0.0000	0.0000	0.0000	83.7000	83.7000	83.7000 (210)
Space heating fuel (main heating system)	241.1845	176.0514	136.0919	62.6039	20.7002	0.0000	0.0000	0.0000	0.0000	61.9519	153.4988	246.9980 (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)												

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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	0.0000	(213)	
	0.0000	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	185.1852	163.6658	173.5275	151.6536	146.4071	131.2640	129.0258	134.4896	136.3507	152.8438	163.5162	183.0347	183.0347	(64)	
Efficiency of water heater (217)m	88.4601	88.4362	88.3975	88.3279	88.2526	88.2000	88.2000	88.2000	88.2000	88.3261	88.4193	88.4645	88.4645	(216)	
Fuel for water heating, kWh/month	209.3432	185.0665	196.3037	171.6939	165.8954	148.8254	146.2878	152.4825	154.5926	173.0449	184.9327	206.9019	206.9019	(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	0.0000	(221)	
Pumps and Fa	15.9796	14.4332	15.9796	15.4641	15.9796	15.4641	15.9796	15.9796	15.4641	15.9796	15.4641	15.9796	15.9796	(231)	
Lighting	12.7421	10.2222	9.2040	6.7432	5.2087	4.2555	4.7515	6.1762	8.0223	10.5257	11.8887	13.0963	13.0963	(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	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	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	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	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	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	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	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	0.0000	(235d)	
Annual totals kWh/year															
Space heating fuel - main system 1													1099.0806	(211)	
Space heating fuel - main system 2													0.0000	(213)	
Space heating fuel - secondary													0.0000	(215)	
Efficiency of water heater													88.2000		
Water heating fuel used													2095.3706	(219)	
Space cooling fuel													0.0000	(221)	
Electricity for pumps and fans:															
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)															
mechanical ventilation fans (SFP = 0.8400)														102.1469	(230a)
central heating pump														41.0000	(230c)
main heating flue fan														45.0000	(230e)
Total electricity for the above, kWh/year															
Electricity for lighting (calculated in Appendix L)														188.1469	(231)
														102.8364	(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														3485.4345	(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	1099.0806	0.2100	230.8069 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2095.3706	0.2100	440.0278 (264)
Space and water heating			670.8347 (265)
Pumps, fans and electric keep-hot	188.1469	0.1387	26.0983 (267)
Energy for lighting	102.8364	0.1443	14.8425 (268)
Total CO2, kg/year			711.7755 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			17.8500 (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	1099.0806	1.1300	1241.9611 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2095.3706	1.1300	2367.7687 (278)
Space and water heating			3609.7298 (279)
Pumps, fans and electric keep-hot	188.1469	1.5128	284.6287 (281)
Energy for lighting	102.8364	1.5338	157.7339 (282)
Total Primary energy kWh/year			4052.0924 (286)
Dwelling Primary energy Rate (DPER)			101.6300 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	x	Storey height (m)	=	Volume (m ³)
Ground floor	39.8700 (1b)		2.5000 (2b)		99.6750 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.8700				(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 99.6750 (5)

2. Ventilation rate

		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2007 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4507 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3493 (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	0.4453	0.4366	0.4278	0.3842	0.3754	0.3318	0.3318	0.3231	0.3493	0.3754	0.3929	0.4104 (22b)
Effective ac	0.5991	0.5953	0.5915	0.5738	0.5705	0.5550	0.5550	0.5522	0.5610	0.5705	0.5772	0.5842 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.3300	1.0000	2.3300		(26)
TER Opening Type (Uw = 1.20)			7.6400	1.1450	8.7481		(27)
Ground Floor			39.8700	0.1300	5.1831		(28a)
External Walls	41.0250	9.9700	31.0550	0.1800	5.5899		(29a)
Flat Roof	7.3200		7.3200	0.1100	0.8052		(30)
Total net area of external elements Aum(A, m ²)			88.2150				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.6563		(33)
Party Walls			22.1500	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 229.3750 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.0700	0.0500	0.2535
E3 Sill	0.6300	0.0500	0.0315
E4 Jamb	15.9000	0.0500	0.7950
E5 Ground floor (normal)	16.4100	0.1600	2.6256
E15 Flat roof with parapet	7.6200	0.5600	4.2672
E16 Corner (normal)	5.0000	0.0900	0.4500
E7 Party floor between dwellings (in blocks of flats)	8.7900	0.0700	0.6153
P1 Party wall - Ground floor	8.8600	0.0800	0.7088
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.8600	0.0000	0.0000
E18 Party wall between dwellings	2.5000	0.0600	0.1500
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.8969 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 32.5532 (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	19.7076	19.5809	19.4568	18.8738	18.7647	18.2569	18.2569	18.1629	18.4525	18.7647	18.9854	19.2161 (38)
Heat transfer coeff	52.2608	52.1341	52.0100	51.4270	51.3179	50.8101	50.8101	50.7161	51.0057	51.3179	51.5386	51.7693 (39)
Average = Sum(39)m / 12 =												51.4264

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3108	1.3076	1.3045	1.2899	1.2871	1.2744	1.2744	1.2720	1.2793	1.2871	1.2927	1.2985 (40)
HLP (average)												1.2899
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.4029 (42)
Hot water usage for mixer showers	47.7412	47.0237	45.9782	43.9779	42.5017	40.8555	39.9198	40.9573	42.0947	43.8622	45.9055	47.5583 (42a)
Hot water usage for baths	20.6535	20.3468	19.9148	19.1184	18.5220	17.8608	17.5036	17.9325	18.3995	19.1071	19.9199	20.5837 (42b)
Hot water usage for other uses	28.9969	27.9425	26.8881	25.8336	24.7792	23.7248	23.7248	24.7792	25.8336	26.8881	27.9425	28.9969 (42c)
Average daily hot water use (litres/day)												89.5257 (43)
Daily hot water use	97.3916	95.3130	92.7811	88.9299	85.8030	82.4410	81.1481	83.6690	86.3279	89.8574	93.7680	97.1389 (44)
Energy conte	154.2445	135.7244	142.6011	121.7406	115.5073	101.3709	98.1416	103.5997	106.4509	121.9357	133.5897	152.0960 (45)
Energy content (annual)										Total = Sum(45)m =		1487.0024
Distribution loss (46)m = 0.15 x (45)m	23.1367	20.3587	21.3902	18.2611	17.3261	15.2056	14.7212	15.5400	15.9676	18.2904	20.0385	22.8144 (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	49.6297	43.8701	47.2802	43.8559	43.7242	40.6558	41.3522	42.6368	42.5726	45.7904	46.2417	49.5009 (61)
Total heat required for water heating calculated for each month	203.8742	179.5945	189.8814	165.5965	159.2315	142.0267	139.4938	146.2366	149.0235	167.7260	179.8314	201.5969 (62)
WWHRS	-21.8253	-19.3024	-20.2124	-16.7367	-15.5980	-13.3473	-12.5110	-13.3042	-13.8096	-16.2800	-18.4433	-21.4211 (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	182.0489	160.2921	169.6690	148.8598	143.6335	128.6794	126.9828	132.9324	135.2139	151.4460	161.3881	180.1758 (64)
								Total per year (kWh/year) = Sum(64)m =				1821.3218 (64)
12Total per year (kWh/year)												1821 (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	63.6937	56.0959	59.2349	51.4427	49.3372	43.8698	42.9701	45.1061	46.0381	51.9912	55.9790	62.9471 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	61.8753	68.5048	61.8753	63.9378	61.8753	63.9378	61.8753	61.8753	63.9378	61.8753	63.9378	61.8753 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	121.2066	122.4643	119.2949	112.5474	104.0300	96.0248	90.6769	89.4191	92.5886	99.3360	107.8535	115.8586 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144 (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)	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154 (71)
Water heating gains (Table 5)	85.6098	83.4760	79.6169	71.4482	66.3135	60.9302	57.7556	60.6265	63.9418	69.8806	77.7486	84.6064 (72)
Total internal gains	315.7350	321.4884	307.8303	294.9767	279.2620	264.9361	254.3510	255.9642	264.5114	278.1352	296.5832	309.3836 (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						
North	0.7900	10.6334	0.6300	0.7000	0.7700	2.5673 (74)						
South	2.1500	46.7521	0.6300	0.7000	0.7700	30.7193 (78)						
West	4.7000	19.6403	0.6300	0.7000	0.7700	28.2109 (80)						
Solar gains	61.4975	110.4030	163.3075	218.3719	255.9613	258.2392	247.3161	219.2175	182.6715	125.5880	74.7556	51.8838 (83)
Total gains	377.2325	431.8914	471.1378	513.3486	535.2233	523.1753	501.6670	475.1817	447.1830	403.7232	371.3387	361.2674 (84)

7. Mean internal temperature (heating season)

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Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	2186.6813 (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)	103.7590 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-985.3373 (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	3098.0976 (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	1706.9946	0.2100	358.4689 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2186.6813	0.2100	459.2031 (264)
Space and water heating			817.6719 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	103.7590	0.1443	14.9756 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-424.8039	0.1343	-57.0488
PV Unit electricity exported	-560.5334	0.1258	-70.5298
Total			-127.5786 (269)
Total CO2, kg/year			716.9983 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.9800 (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	1706.9946	1.1300	1928.9039 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2186.6813	1.1300	2470.9499 (278)
Space and water heating			4399.8537 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	103.7590	1.5338	159.1491 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-424.8039	1.4963	-635.6393
PV Unit electricity exported	-560.5334	0.4619	-258.8922
Total			-894.5315 (283)
Total Primary energy kWh/year			3794.5721 (286)
Target Primary Energy Rate (TPER)			95.1700 (287)

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Property Reference	London Road 1		Issued on Date	26/09/2023	
Assessment Reference	02 Be Green	Prop Type Ref			
Property	Flat 1, 39-41, London Road, Enfield, EN2 6LX				
SAP Rating	93 A	DER	1.00	TER	17.47
Environmental	99 A	% DER < TER			94.28
CO ₂ Emissions (t/year)	0.01	DFEE	44.12	TFEE	46.15
Compliance Check	See BREL	% DFEE < TFEE			4.39
% DPER < TPER	69.98	DPER	27.73	TPER	92.39
Assessor Details	Mr. Thomas McMahon			Assessor ID	R863-0001
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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	39.8700 (1b)	2.5000 (2b)	99.6750 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.8700		
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 99.6750 (5)

2. Ventilation rate

	m ³ 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)

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		4.0000 (17)
Infiltration rate		0.2000 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1550 (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	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821 (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) =												86.4000 (23c)
Effective ac	0.2656	0.2617	0.2579	0.2385	0.2346	0.2152	0.2152	0.2114	0.2230	0.2346	0.2424	0.2501 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value KJ/m ² K	A x K kJ/K
Glazing (Uw = 1.20)			8.3300	1.1450	9.5382		(27)
Door			2.3300	1.2000	2.7960		(26)
Ground Floor			39.8700	0.1200	4.7844	110.0000	4385.7000 (28a)

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External Walls	41.0250	10.6600	30.3650	0.1800	5.4657	60.0000	1821.9000 (29a)
Flat Roof	7.3200		7.3200	0.1300	0.9516	9.0000	65.8800 (30)
Total net area of external elements Aum(A, m2)			88.2150				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.5359		(33)
Party Walls			22.1500	0.0000	0.0000	70.0000	1550.5000 (32)
Party Ceiling 1			32.5500			20.0000	651.0000 (32b)
Internal Walls			38.3000			9.0000	344.7000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 8819.6800 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 221.2109 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	5.0700	0.2440	1.2371
E2 Other lintels (including other steel lintels)			
E3 Sill	0.6300	0.0210	0.0132
E4 Jamb	15.9000	0.0160	0.2544
E5 Ground floor (normal)	16.4100	0.0430	0.7056
E15 Flat roof with parapet	7.6200	0.3000	2.2860
E16 Corner (normal)	5.0000	0.0350	0.1750
E7 Party floor between dwellings (in blocks of flats)	8.7900	0.1400	1.2306
P1 Party wall - Ground floor	8.8600	0.0360	0.3190
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.8600	0.0000	0.0000
E18 Party wall between dwellings	2.5000	0.0550	0.1375

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.3584 (36)
 Point Thermal bridges 0.0000 (36a) =
 Total fabric heat loss (33) + (36) + (36a) = 29.8943 (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	8.7371	8.6097	8.4822	7.8449	7.7175	7.0802	7.0802	6.9527	7.3351	7.7175	7.9724	8.2273 (38)
Heat transfer coeff	38.6314	38.5039	38.3765	37.7392	37.6117	36.9744	36.9744	36.8470	37.2294	37.6117	37.8666	38.1216 (39)
Average = Sum(39)m / 12 =												37.7073

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9689	0.9657	0.9625	0.9466	0.9434	0.9274	0.9274	0.9242	0.9338	0.9434	0.9498	0.9561 (40)
HLP (average)												0.9458
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4029 (42)

Hot water usage for mixer showers	47.7412	47.0237	45.9782	43.9779	42.5017	40.8555	39.9198	40.9573	42.0947	43.8622	45.9055	47.5583 (42a)
Hot water usage for baths	20.6535	20.3468	19.9148	19.1184	18.5220	17.8608	17.5036	17.9325	18.3995	19.1071	19.9199	20.5837 (42b)
Hot water usage for other uses	28.9969	27.9425	26.8881	25.8336	24.7792	23.7248	23.7248	24.7792	25.8336	26.8881	27.9425	28.9969 (42c)
Average daily hot water use (litres/day)												89.5257 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.3916	95.3130	92.7811	88.9299	85.8030	82.4410	81.1481	83.6690	86.3279	89.8574	93.7680	97.1389 (44)
Energy content (annual)	154.2445	135.7244	142.6011	121.7406	115.5073	101.3709	98.1416	103.5997	106.4509	121.9357	133.5897	152.0960 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1367	20.3587	21.3902	18.2611	17.3261	15.2056	14.7212	15.5400	15.9676	18.2904	20.0385	22.8144 (46)
Water storage loss:												150.0000 (47)
Store volume												1.2500 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6750 (55)
Enter (49) or (54) in (55)												
Total storage loss	20.9250	18.9000	20.9250	20.2500	20.9250	20.2500	20.9250	20.9250	20.2500	20.9250	20.2500	20.9250 (56)
If cylinder contains dedicated solar storage	20.9250	18.9000	20.9250	20.2500	20.9250	20.2500	20.9250	20.9250	20.2500	20.9250	20.2500	20.9250 (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	198.4319	175.6356	186.7885	164.5026	159.6947	144.1329	142.3290	147.7871	149.2129	166.1231	176.3517	196.2834 (62)
WVHRS	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	198.4319	175.6356	186.7885	164.5026	159.6947	144.1329	142.3290	147.7871	149.2129	166.1231	176.3517	196.2834 (64)
12Total per year (kWh/year)												2007.2734 (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	86.6362	77.0573	82.7648	74.6884	73.7561	67.9154	67.9820	69.7968	69.6045	75.8935	78.6282	85.9218 (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	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442 (66)

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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	61.3251	67.8956	61.3251	63.3693	61.3251	63.3693	61.3251	63.3693	61.3251	63.3693	61.3251	63.3693	61.3251 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	121.2066	122.4643	119.2949	112.5474	104.0300	96.0248	90.6769	89.4191	92.5886	99.3360	107.8535	115.8586	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	(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)	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	(71)
Water heating gains (Table 5)	116.4465	114.6686	111.2430	103.7338	99.1345	94.3270	91.3737	93.8130	96.6729	102.0074	109.2058	115.4863	(72)
Total internal gains	343.0215	349.0719	335.9062	323.6938	308.5329	297.7643	287.4189	288.6004	296.6741	306.7118	324.4718	336.7133	(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
North	0.8600	10.6334	0.4000	0.7000	0.7700	1.7744 (74)
South	2.3400	46.7521	0.4000	0.7000	0.7700	21.2279 (78)
West	5.1300	19.6403	0.4000	0.7000	0.7700	19.5504 (80)

Solar gains	42.5528	76.4017	113.0315	151.1659	177.2011	178.7830	171.2188	151.7572	126.4422	86.9155	51.7284	35.8995	(83)
Total gains	385.5743	425.4736	448.9377	474.8596	485.7340	476.5473	458.6377	440.3576	423.1162	393.6273	376.2002	372.6128	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)	63.4176	63.6275	63.8389	64.9169	65.1369	66.2596	66.2596	66.4888	65.8059	65.1369	64.6984	64.2658	21.0000 (85)
tau	5.2278	5.2418	5.2559	5.3278	5.3425	5.4173	5.4173	5.4326	5.3871	5.3425	5.3132	5.2844	
util living area	0.9716	0.9518	0.9154	0.8250	0.6803	0.4909	0.3539	0.3836	0.5902	0.8397	0.9456	0.9753	(86)
Living	20.3179	20.4457	20.6056	20.7918	20.8972	20.9365	20.9419	20.9416	20.9258	20.8016	20.5473	20.3019	
Non living	19.3279	19.4879	19.6841	19.9098	20.0204	20.0672	20.0705	20.0732	20.0545	19.9275	19.6268	19.3169	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.6511	20.4457	20.6056	20.7918	20.8972	20.9365	20.9419	20.9416	20.9258	20.8016	20.5473	20.3995	(87)
Th 2	20.1093	20.1120	20.1147	20.1281	20.1308	20.1443	20.1443	20.1470	20.1389	20.1308	20.1254	20.1200	(88)
util rest of house	0.9647	0.9407	0.8965	0.7904	0.6279	0.4276	0.2855	0.3131	0.5229	0.8004	0.9313	0.9693	(89)
MIT 2	19.7978	19.4879	19.6841	19.9098	20.0204	20.0672	20.0705	20.0732	20.0545	19.9275	19.6268	19.4617	(90)
Living area fraction									fLA = Living area / (4) =				0.9561 (91)
MIT	20.6136	20.4037	20.5652	20.7531	20.8587	20.8983	20.9036	20.9035	20.8876	20.7633	20.5069	20.3584	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.6136	20.4037	20.5652	20.7531	20.8587	20.8983	20.9036	20.9035	20.8876	20.7633	20.5069	20.3584	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9688	0.9446	0.9066	0.8158	0.6721	0.4835	0.3462	0.3757	0.5817	0.8297	0.9380	0.9710	(94)
Useful gains	373.5385	401.9151	407.0177	387.3814	326.4616	230.3899	158.7879	165.4225	246.1187	326.6049	352.8640	361.8193	(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	630.2186	596.9528	539.7729	447.3259	344.4744	232.8762	159.1242	165.9385	252.6979	382.2576	507.6749	615.9829	(97)
Space heating kWh	190.9701	131.0654	98.7699	43.1601	13.4016	0.0000	0.0000	0.0000	0.0000	41.4056	111.4638	189.0977	(98a)
Space heating requirement - total per year (kWh/year)												819.3341	
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	190.9701	131.0654	98.7699	43.1601	13.4016	0.0000	0.0000	0.0000	0.0000	41.4056	111.4638	189.0977	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												819.3341	
Space heating per m2										(98c) / (4) =		20.5501	(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 %)													238.4710 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)

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Space heating requirement	190.9701	131.0654	98.7699	43.1601	13.4016	0.0000	0.0000	0.0000	0.0000	41.4056	111.4638	189.0977	(98)
Space heating efficiency (main heating system 1)	238.4710	238.4710	238.4710	238.4710	238.4710	0.0000	0.0000	0.0000	0.0000	238.4710	238.4710	238.4710	(210)
Space heating fuel (main heating system)	80.0810	54.9607	41.4180	18.0987	5.6198	0.0000	0.0000	0.0000	0.0000	17.3630	46.7410	79.2959	(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 requirement	198.4319	175.6356	186.7885	164.5026	159.6947	144.1329	142.3290	147.7871	149.2129	166.1231	176.3517	196.2834	(64)
Efficiency of water heater (217)m	184.5159	184.5159	184.5159	184.5159	184.5159	184.5159	184.5159	184.5159	184.5159	184.5159	184.5159	184.5159	(216)
Fuel for water heating, kWh/month	107.5419	95.1872	101.2317	89.1536	86.5479	78.1140	77.1364	80.0945	80.8672	90.0318	95.5753	106.3775	(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	8.6755	7.8359	8.6755	8.3956	8.6755	8.3956	8.6755	8.3956	8.6755	8.3956	8.6755	8.3956	(231)
Lighting	12.7421	10.2222	9.2040	6.7432	5.2087	4.2555	4.7515	6.1762	8.0223	10.5257	11.8887	13.0963	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-31.0021	-44.7495	-65.4883	-73.5833	-79.3914	-73.8603	-72.9834	-68.7002	-60.3293	-50.5436	-34.1559	-26.6564	(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	-13.0740	-28.8009	-59.7764	-94.2961	-128.0095	-130.0478	-128.2299	-107.1009	-77.3582	-43.4807	-18.1248	-10.2278	(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												343.5781	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												184.5159	(216)
Water heating fuel used												1087.8591	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400) mechanical ventilation fans (SFP = 0.8400)												102.1469	(230a)
Total electricity for the above, kWh/year												102.1469	(231)
Electricity for lighting (calculated in Appendix L)												102.8364	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1519.9707	(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												116.4498	(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	343.5781	0.1568	53.8583 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1087.8591	0.1408	153.2090 (264)
Space and water heating			207.0672 (265)
Pumps, fans and electric keep-hot	102.1469	0.1387	14.1690 (267)
Energy for lighting	102.8364	0.1443	14.8425 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-681.4437	0.1345	-91.6305
PV Unit electricity exported	-838.5270	0.1247	-104.5664
Total			-196.1969 (269)
Total CO2, kg/year			39.8819 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.0000 (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	343.5781	1.5803	542.9603 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1087.8591	1.5208	1654.3668 (278)

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Space and water heating			2197.3271 (279)
Pumps, fans and electric keep-hot	102.1469	1.5128	154.5279 (281)
Energy for lighting	102.8364	1.5338	157.7339 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-681.4437	1.4970	-1020.0936
PV Unit electricity exported	-838.5270	0.4577	-383.7937
Total			-1403.8872 (283)
Total Primary energy kWh/year			1105.7017 (286)
Dwelling Primary energy Rate (DPER)			27.7300 (287)

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

 1. Overall dwelling characteristics

		Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor		39.8700 (1b)	x 2.5000 (2b)	= 99.6750 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.8700			(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	99.6750 (5)

 2. Ventilation rate

			m ³ per hour
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.2007 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.4507 (18)
Number of sides sheltered			3 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.3493 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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												
Effective ac	0.4453	0.4366	0.4278	0.3842	0.3754	0.3318	0.3318	0.3231	0.3493	0.3754	0.3929	0.4104 (22b)
	0.5991	0.5953	0.5915	0.5738	0.5705	0.5550	0.5550	0.5522	0.5610	0.5705	0.5772	0.5842 (25)

 3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.3300	1.0000	2.3300		(26)
TER Opening Type (Uw = 1.20)			7.6400	1.1450	8.7481		(27)
Ground Floor			39.8700	0.1300	5.1831		(28a)
External Walls	41.0250	9.9700	31.0550	0.1800	5.5899		(29a)
Flat Roof	7.3200		7.3200	0.1100	0.8052		(30)
Total net area of external elements Aum(A, m ²)			88.2150				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.6563		(33)
Party Walls			22.1500	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 229.3750 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.0700	0.0500	0.2535
E3 Sill	0.6300	0.0500	0.0315
E4 Jamb	15.9000	0.0500	0.7950
E5 Ground floor (normal)	16.4100	0.1600	2.6256

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E15 Flat roof with parapet	7.6200	0.5600	4.2672	
E16 Corner (normal)	5.0000	0.0900	0.4500	
E7 Party floor between dwellings (in blocks of flats)	8.7900	0.0700	0.6153	
P1 Party wall - Ground floor	8.8600	0.0800	0.7088	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.8600	0.0000	0.0000	
E18 Party wall between dwellings	2.5000	0.0600	0.1500	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.8969 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 32.5532 (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	19.7076	19.5809	19.4568	18.8738	18.7647	18.2569	18.2569	18.1629	18.4525	18.7647	18.9854	19.2161 (38)
Heat transfer coeff	52.2608	52.1341	52.0100	51.4270	51.3179	50.8101	50.8101	50.7161	51.0057	51.3179	51.5386	51.7693 (39)
Average = Sum(39)m / 12 =												51.4264

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3108	1.3076	1.3045	1.2899	1.2871	1.2744	1.2744	1.2720	1.2793	1.2871	1.2927	1.2985 (40)
HLP (average)												1.2899
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4029 (42)

Hot water usage for mixer showers	47.7412	47.0237	45.9782	43.9779	42.5017	40.8555	39.9198	40.9573	42.0947	43.8622	45.9055	47.5583 (42a)
Hot water usage for baths	20.6535	20.3468	19.9148	19.1184	18.5220	17.8608	17.5036	17.9325	18.3995	19.1071	19.9199	20.5837 (42b)
Hot water usage for other uses	28.9969	27.9425	26.8881	25.8336	24.7792	23.7248	23.7248	24.7792	25.8336	26.8881	27.9425	28.9969 (42c)
Average daily hot water use (litres/day)												89.5257 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.3916	95.3130	92.7811	88.9299	85.8030	82.4410	81.1481	83.6690	86.3279	89.8574	93.7680	97.1389 (44)
Energy content (annual)	154.2445	135.7244	142.6011	121.7406	115.5073	101.3709	98.1416	103.5997	106.4509	121.9357	133.5897	152.0960 (45)
Distribution loss (46)m = 0.15 x (45)m	23.1367	20.3587	21.3902	18.2611	17.3261	15.2056	14.7212	15.5400	15.9676	18.2904	20.0385	22.8144 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	200.8394	177.8101	189.1960	166.8325	162.1022	146.4627	144.7365	150.1946	151.5427	168.5306	178.6815	198.6909 (62)
MWHR	-21.8253	-19.3024	-20.2124	-16.7367	-15.5980	-13.3473	-12.5110	-13.3042	-13.8096	-16.2800	-18.4433	-21.4211 (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	179.0141	158.5077	168.9836	150.0958	146.5042	133.1154	132.2255	136.8905	137.7331	152.2505	160.2382	177.2698 (64)
12Total per year (kWh/year)												1832.8285 (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	88.5622	78.7969	84.6908	76.5522	75.6821	69.7793	69.9080	71.7228	71.4684	77.8195	80.4920	87.8478 (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	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442	70.1442 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	61.8753	68.5048	61.8753	63.9378	61.8753	63.9378	61.8753	61.8753	63.9378	61.8753	63.9378	61.8753 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	121.2066	122.4643	119.2949	112.5474	104.0300	96.0248	90.6769	89.4191	92.5886	99.3360	107.8535	115.8586 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144	30.0144 (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)	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154	-56.1154 (71)
Water heating gains (Table 5)	119.0352	117.2574	113.8317	106.3225	101.7232	96.9157	93.9624	96.4017	99.2617	104.5961	111.7945	118.0751 (72)
Total internal gains	349.1604	355.2698	342.0452	329.8511	314.6718	300.9216	290.5578	291.7393	299.8313	312.8507	330.6290	342.8523 (73)

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6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North					0.7900	10.6334	0.6300		0.7000		0.7700	2.5673 (74)
South					2.1500	46.7521	0.6300		0.7000		0.7700	30.7193 (78)
West					4.7000	19.6403	0.6300		0.7000		0.7700	28.2109 (80)
Solar gains	61.4975	110.4030	163.3075	218.3719	255.9613	258.2392	247.3161	219.2175	182.6715	125.5880	74.7556	51.8838 (83)
Total gains	410.6579	465.6727	505.3526	548.2229	570.6331	559.1607	537.8739	510.9569	482.5028	438.4387	405.3846	394.7360 (84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	48.6087	48.7268	48.8431	49.3968	49.5018	49.9965	49.9965	50.0892	49.8048	49.5018	49.2898	49.0702
alpha	4.2406	4.2485	4.2562	4.2931	4.3001	4.3331	4.3331	4.3393	4.3203	4.3001	4.2860	4.2713
util living area	0.9779	0.9618	0.9316	0.8586	0.7327	0.5570	0.4102	0.4482	0.6673	0.8816	0.9602	0.9810 (86)
MIT	19.6860	19.9076	20.2088	20.5757	20.8343	20.9614	20.9918	20.9880	20.9160	20.5877	20.0845	19.6513 (87)
Th 2	20.3446	20.3462	20.3478	20.3551	20.3564	20.3628	20.3628	20.3640	20.3604	20.3564	20.3537	20.3508 (88)
util rest of house	0.9747	0.9564	0.9218	0.8390	0.6985	0.5080	0.3529	0.3893	0.6195	0.8610	0.9536	0.9782 (89)
MIT 2	19.1224	19.3418	19.6375	19.9935	20.2286	20.3383	20.3589	20.3580	20.3031	20.0113	19.5239	19.0929 (90)
Living area fraction	fLA = Living area / (4) =											0.9561 (91)
MIT	19.6612	19.8828	20.1838	20.5501	20.8077	20.9340	20.9640	20.9603	20.8891	20.5624	20.0599	19.6268 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6612	19.8828	20.1838	20.5501	20.8077	20.9340	20.9640	20.9603	20.8891	20.5624	20.0599	19.6268 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9707	0.9520	0.9191	0.8452	0.7228	0.5520	0.4070	0.4446	0.6594	0.8679	0.9502	0.9744 (94)
Useful gains	398.6095	443.3011	464.4742	463.3797	412.4730	308.6694	218.9069	227.1596	318.1429	380.5416	385.2000	384.6495 (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	802.7905	781.1138	711.6927	599.1305	467.3863	321.8320	221.7338	231.2805	346.2805	511.2493	667.9363	798.6315 (97)
Space heating kWh	300.7107	227.0101	183.9306	97.7406	40.8555	0.0000	0.0000	0.0000	0.0000	97.2465	203.5701	308.0026 (98a)
Space heating requirement - total per year (kWh/year)												1459.0667
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	300.7107	227.0101	183.9306	97.7406	40.8555	0.0000	0.0000	0.0000	0.0000	97.2465	203.5701	308.0026 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1459.0667
Space heating per m2												(98c) / (4) = 36.5956 (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	300.7107	227.0101	183.9306	97.7406	40.8555	0.0000	0.0000	0.0000	0.0000	97.2465	203.5701	308.0026 (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)	325.7971	245.9481	199.2747	105.8945	44.2638	0.0000	0.0000	0.0000	0.0000	105.3592	220.5527	333.6973 (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	179.0141	158.5077	168.9836	150.0958	146.5042	133.1154	132.2255	136.8905	137.7331	152.2505	160.2382	177.2698 (64)
Efficiency of water heater												79.8000 (216)
(217)m	85.2137	84.8647	84.2503	83.1224	81.6035	79.8000	79.8000	79.8000	79.8000	83.0821	84.5977	85.2863 (217)
Fuel for water heating, kWh/month	210.0767	186.7768	200.5734	180.5719	179.5318	166.8113	165.6962	171.5420	172.5978	183.2532	189.4121	207.8527 (219)
Space cooling fuel requirement												

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(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	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	12.8565	10.3139	9.2866	6.8037	5.2554	4.2937	4.7941	6.2316	8.0942	10.6201	11.9954	13.2138	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-19.2226	-27.4017	-39.8491	-45.3941	-49.5166	-46.4979	-45.9925	-43.1740	-38.2347	-31.6656	-21.2656	-16.5895	(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	-9.9662	-21.0612	-42.0118	-63.2921	-83.8355	-84.2225	-83.1642	-70.2916	-51.4047	-30.1065	-13.3088	-7.8684	(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													1580.7873	(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													2214.6959	(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)													103.7590	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-985.3373	(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													2999.9049	(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	1580.7873	0.2100	331.9653 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2214.6959	0.2100	465.0861 (264)
Space and water heating			797.0515 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	103.7590	0.1443	14.9756 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-424.8039	0.1343	-57.0488
PV Unit electricity exported	-560.5334	0.1258	-70.5298
Total			-127.5786 (269)
Total CO2, kg/year			696.3778 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.4700 (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	1580.7873	1.1300	1786.2896 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2214.6959	1.1300	2502.6064 (278)
Space and water heating			4288.8960 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	103.7590	1.5338	159.1491 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-424.8039	1.4963	-635.6393
PV Unit electricity exported	-560.5334	0.4619	-258.8922
Total			-894.5315 (283)
Total Primary energy kWh/year			3683.6144 (286)
Target Primary Energy Rate (TPER)			92.3900 (287)

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Property Reference	London Road 2		Issued on Date	26/09/2023	
Assessment Reference	01 Be Lean	Prop Type Ref			
Property	Flat 2, 39-41, London Road, Enfield, EN2 6LX				
SAP Rating	83 B	DER	17.21	TER	16.41
Environmental	88 B	% DER < TER			-4.88
CO ₂ Emissions (t/year)	0.82	DFEE	47.10	TFEE	47.92
Compliance Check	See BREL	% DFEE < TFEE			1.70
% DPER < TPER	-12.88	DPER	97.67	TPER	86.53
Assessor Details	Mr. Thomas McMahon			Assessor ID	R863-0001
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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.8100 (1b)	2.5000 (2b)	134.5250 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.8100		
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 134.5250 (5)

2. Ventilation rate

	m ³ 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)

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		4.0000 (17)
Infiltration rate		0.2000 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1550 (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	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821 (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) =												86.4000 (23c)
Effective ac	0.2656	0.2617	0.2579	0.2385	0.2346	0.2152	0.2152	0.2114	0.2230	0.2346	0.2424	0.2501 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value KJ/m ² K	A x K kJ/K
Glazing (Uw = 1.20)			13.0200	1.1450	14.9084		(27)
Door			2.3300	1.2000	2.7960		(26)
Ground Floor			53.8100	0.1200	6.4572	110.0000	5919.1000 (28a)

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External Walls	78.7000	15.3500	63.3500	0.1800	11.4030	60.0000	3801.0000 (29a)
Flat Roof	14.2600		14.2600	0.1300	1.8538	9.0000	128.3400 (30)
Total net area of external elements Aum(A, m2)			146.7700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.4184		(33)
Party Walls			19.8000	0.0000	0.0000	70.0000	1386.0000 (32)
Party Ceiling 1			39.5500			20.0000	791.0000 (32b)
Internal Walls			60.1000			9.0000	540.9000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12566.3400 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 233.5317 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	7.1000	0.2440	1.7324
E2 Other lintels (including other steel lintels)			
E3 Sill	0.6800	0.0210	0.0143
E4 Jamb	16.1800	0.0160	0.2589
E5 Ground floor (normal)	31.4800	0.0430	1.3536
E15 Flat roof with parapet	10.7000	0.3000	3.2100
E16 Corner (normal)	12.5000	0.0350	0.4375
E7 Party floor between dwellings (in blocks of flats)	20.7800	0.1400	2.9092
P1 Party wall - Ground floor	7.9200	0.0360	0.2851
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.9200	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0710	-0.3550
E25 Staggered party wall between dwellings	5.0000	0.0440	0.2200
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.0660 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 47.4844 (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	11.7920	11.6199	11.4479	10.5878	10.4158	9.5556	9.5556	9.3836	9.8997	10.4158	10.7598	11.1039 (38)
Heat transfer coeff	59.2764	59.1044	58.9323	58.0722	57.9002	57.0401	57.0401	56.8680	57.3841	57.9002	58.2442	58.5883 (39)
Average = Sum(39)m / 12 =												58.0292

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1016	1.0984	1.0952	1.0792	1.0760	1.0600	1.0600	1.0568	1.0664	1.0760	1.0824	1.0888 (40)
HLP (average)												1.0784
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8024 (42)

Hot water usage for mixer showers	54.4401	53.6220	52.4298	50.1488	48.4654	46.5882	45.5212	46.7043	48.0013	50.0169	52.3469	54.2315 (42a)
Hot water usage for baths	23.5342	23.1847	22.6925	21.7850	21.1055	20.3520	19.9450	20.4337	20.9659	21.7722	22.6984	23.4547 (42b)
Hot water usage for other uses	33.0885	31.8853	30.6821	29.4789	28.2757	27.0724	27.0724	28.2757	29.4789	30.6821	31.8853	33.0885 (42c)
Average daily hot water use (litres/day)												102.0924 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.0629	108.6920	105.8044	101.4127	97.8466	94.0126	92.5386	95.4137	98.4461	102.4711	106.9306	110.7747 (44)
Energy conte	175.8964	154.7760	162.6174	138.8289	131.7203	115.5995	111.9174	118.1421	121.3938	139.0524	152.3422	173.4464 (45)
Energy content (annual)										Total = Sum(45)m =		1695.7329
Distribution loss (46)m = 0.15 x (45)m	26.3845	23.2164	24.3926	20.8243	19.7580	17.3399	16.7876	17.7213	18.2091	20.8579	22.8513	26.0170 (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												
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 (57)
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 (59)
Total heat required for water heating calculated for each month	30.9612	27.9617	30.9506	29.9374	30.9236	29.9132	30.9034	30.9107	29.9219	30.9318	29.9482	30.9593 (61)
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 (62)
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 (63a)
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 (63b)
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 (63c)
Output from w/h	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)
Total per year (kWh/year)	206.8577	182.7377	193.5680	168.7662	162.6439	145.5127	142.8208	149.0528	151.3158	169.9841	182.2904	204.4057 (64)
Electric shower(s)										Total per year (kWh/year) = Sum(64)m =		2059.9558 (64)
												2060 (64)
Heat gains from water heating, kWh/month	66.2259	58.4534	61.8080	53.6449	51.5279	45.9151	44.9384	47.0099	47.8439	53.9678	58.1408	65.4108 (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	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.2458	87.7365	79.2458	81.8874	79.2458	81.8874	79.2458	79.2458	81.8874	79.2458	81.8874	79.2458 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	157.1138	158.7441	154.6357	145.8893	134.8486	124.4719	117.5396	115.9093	120.0177	128.7641	139.8048	150.1815 (68)
Pumps, fans	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966 (71)
Total internal gains	89.0133	86.9843	83.0752	74.5069	69.2579	63.7710	60.4011	63.1854	66.4499	72.5374	80.7511	87.9177 (72)
	378.4091	386.5011	369.9929	355.3198	336.3886	320.1665	307.2228	308.3767	318.3912	333.5836	355.4795	370.3812 (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						
North	4.0400	10.6334	0.4000	0.7000	0.7700	8.3357 (74)						
South	8.9800	46.7521	0.4000	0.7000	0.7700	81.4645 (78)						
Solar gains	89.8002	149.3479	197.0197	235.5610	258.7317	255.3295	246.7491	229.2210	210.0793	162.8663	106.8464	77.3419 (83)
Total gains	468.2093	535.8490	567.0127	590.8807	595.1204	575.4960	553.9719	537.5978	528.4705	496.4499	462.3259	447.7231 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)	58.8877	59.0591	59.2315	60.1088	60.2874	61.1965	61.1965	61.3816	60.8296	60.2874	59.9313	59.5793
tau	4.9258	4.9373	4.9488	5.0073	5.0192	5.0798	5.0798	5.0921	5.0553	5.0192	4.9954	4.9720
util living area	0.9867	0.9735	0.9516	0.8967	0.7896	0.6098	0.4486	0.4801	0.6964	0.9030	0.9729	0.9890 (86)
MIT	20.0972	20.2528	20.4357	20.6620	20.8286	20.9164	20.9350	20.9336	20.8940	20.6923	20.3635	20.0741 (87)
Th 2	19.9995	20.0021	20.0048	20.0178	20.0205	20.0336	20.0336	20.0362	20.0284	20.0295	20.0152	20.0100 (88)
util rest of house	0.9829	0.9662	0.9381	0.8682	0.7353	0.5276	0.3524	0.3828	0.6171	0.8705	0.9642	0.9859 (89)
MIT 2	18.9585	19.1559	19.3849	19.6665	19.8507	19.9424	19.9540	19.9561	19.9208	19.7088	19.3077	18.9377 (90)
Living area fraction	19.5104	19.6875	19.8942	20.1490	20.3247	20.4144	20.4295	20.4299	20.3925	20.1855	19.8194	19.4847 (91)
MIT	19.5104	19.6875	19.8942	20.1490	20.3247	20.4144	20.4295	20.4299	20.3925	20.1855	19.8194	19.4885 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5104	19.6875	19.8942	20.1490	20.3247	20.4144	20.4295	20.4299	20.3925	20.1855	19.8194	19.4885 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9805	0.9634	0.9363	0.8724	0.7533	0.5609	0.3922	0.4231	0.6482	0.8767	0.9621	0.9838 (94)
Useful gains	459.0987	516.2573	530.8983	515.4864	448.2878	322.7967	217.2591	227.4506	342.5659	435.2241	444.8012	440.4839 (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	901.6146	874.0071	789.3494	653.2525	499.3697	331.6557	218.4341	229.1711	361.0884	555.0019	740.8300	895.7262 (97)
Space heating kWh	329.2318	240.4079	192.2877	99.1916	38.0050	0.0000	0.0000	0.0000	0.0000	89.1147	213.1407	338.7003 (98a)
Space heating requirement - total per year (kWh/year)												1540.0795
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	329.2318	240.4079	192.2877	99.1916	38.0050	0.0000	0.0000	0.0000	0.0000	89.1147	213.1407	338.7003 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1540.0795
Space heating per m2										(98c) / (4) =		28.6207 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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 %)												83.7000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	329.2318	240.4079	192.2877	99.1916	38.0050	0.0000	0.0000	0.0000	0.0000	89.1147	213.1407	338.7003 (98)
Space heating efficiency (main heating system 1)	83.7000	83.7000	83.7000	83.7000	83.7000	0.0000	0.0000	0.0000	0.0000	83.7000	83.7000	83.7000 (210)
Space heating fuel (main heating system)	393.3474	287.2256	229.7344	118.5085	45.4062	0.0000	0.0000	0.0000	0.0000	106.4691	254.6484	404.6598 (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)												

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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	0.0000	(213)
	0.0000	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	206.8577	182.7377	193.5680	168.7662	162.6439	145.5127	142.8208	149.0528	151.3158	169.9841	182.2904	204.4057	204.4057	(64)
Efficiency of water heater (217)m	88.5064	88.4834	88.4485	88.3844	88.2943	88.2000	88.2000	88.2000	88.2000	88.3713	88.4688	88.5112	88.2000	(216)
Fuel for water heating, kWh/month	233.7206	206.5220	218.8484	190.9457	184.2067	164.9804	161.9283	168.9941	171.5598	192.3521	206.0504	230.9378	230.9378	(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	0.0000	(221)
Pumps and Fa	19.0129	17.1729	19.0129	18.3996	19.0129	18.3996	19.0129	19.0129	18.3996	19.0129	18.3996	19.0129	18.3996	(231)
Lighting	16.4657	13.2094	11.8936	8.7138	6.7308	5.4991	6.1400	7.9810	10.3666	13.6015	15.3629	16.9234	16.9234	(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	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	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	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	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	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	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	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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1														1839.9994 (211)
Space heating fuel - main system 2														0.0000 (213)
Space heating fuel - secondary														0.0000 (215)
Efficiency of water heater														88.2000
Water heating fuel used														2331.0464 (219)
Space cooling fuel														0.0000 (221)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)														
mechanical ventilation fans (SFP = 0.8400)														137.8612 (230a)
central heating pump														41.0000 (230c)
main heating flue fan														45.0000 (230e)
Total electricity for the above, kWh/year														223.8612 (231)
Electricity for lighting (calculated in Appendix L)														132.8878 (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														4527.7948 (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	1839.9994	0.2100	386.3999 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2331.0464	0.2100	489.5197 (264)
Space and water heating			875.9196 (265)
Pumps, fans and electric keep-hot	223.8612	0.1387	31.0523 (267)
Energy for lighting	132.8878	0.1443	19.1798 (268)
Total CO2, kg/year			926.1517 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			17.2100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1839.9994	1.1300	2079.1994 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2331.0464	1.1300	2634.0824 (278)
Space and water heating			4713.2818 (279)
Pumps, fans and electric keep-hot	223.8612	1.5128	338.6573 (281)
Energy for lighting	132.8878	1.5338	203.8277 (282)
Total Primary energy kWh/year			5255.7668 (286)
Dwelling Primary energy Rate (DPER)			97.6700 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.8100 (1b)	x 2.5000 (2b)	= 134.5250 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.8100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	134.5250 (5)

2. Ventilation rate

		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1487 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3987 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3090 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3939	0.3862	0.3785	0.3399	0.3321	0.2935	0.2935	0.2858	0.3090	0.3321	0.3476	0.3630 (22b)
Effective ac	0.5776	0.5746	0.5716	0.5578	0.5552	0.5431	0.5431	0.5408	0.5477	0.5552	0.5604	0.5659 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.3300	1.0000	2.3300		(26)
TER Opening Type (Uw = 1.20)			11.1200	1.1450	12.7328		(27)
Ground Floor			53.8100	0.1300	6.9953		(28a)
External Walls	78.7000	13.4500	65.2500	0.1800	11.7450		(29a)
Flat Roof	14.2600		14.2600	0.1100	1.5686		(30)
Total net area of external elements Aum(A, m ²)			146.7700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.3717		(33)
Party Walls			19.8000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 240.8816 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	7.1000	0.0500	0.3550
E3 Sill	0.6800	0.0500	0.0340
E4 Jamb	16.1800	0.0500	0.8090
E5 Ground floor (normal)	31.4800	0.1600	5.0368
E15 Flat roof with parapet	10.7000	0.5600	5.9920
E16 Corner (normal)	12.5000	0.0900	1.1250
E7 Party floor between dwellings (in blocks of flats)	20.7800	0.0700	1.4546
P1 Party wall - Ground floor	7.9200	0.0800	0.6336
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.9200	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0900	-0.4500
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.2900 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 50.6617 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	25.6412	25.5075	25.3764	24.7606	24.6453	24.1090	24.1090	24.0096	24.3156	24.6453	24.8784	25.1221 (38)
Heat transfer coeff	76.3030	76.1692	76.0381	75.4223	75.3071	74.7707	74.7707	74.6714	74.9773	75.3071	75.5401	75.7838 (39)
Average = Sum(39)m / 12 =												75.4217

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.4180	1.4155	1.4131	1.4016	1.3995	1.3895	1.3895	1.3877	1.3934	1.3995	1.4038	1.4084 (40)
HLP (average)												1.4016
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.8024 (42)
Hot water usage for mixer showers	54.4401	53.6220	52.4298	50.1488	48.4654	46.5882	45.5212	46.7043	48.0013	50.0169	52.3469	54.2315 (42a)
Hot water usage for baths	23.5342	23.1847	22.6925	21.7850	21.1055	20.3520	19.9450	20.4337	20.9659	21.7722	22.6984	23.4547 (42b)
Hot water usage for other uses	33.0885	31.8853	30.6821	29.4789	28.2757	27.0724	27.0724	28.2757	29.4789	30.6821	31.8853	33.0885 (42c)
Average daily hot water use (litres/day)												102.0924 (43)
Daily hot water use	111.0629	108.6920	105.8044	101.4127	97.8466	94.0126	92.5386	95.4137	98.4461	102.4711	106.9306	110.7747 (44)
Energy content (annual)	175.8964	154.7760	162.6174	138.8289	131.7203	115.5995	111.9174	118.1421	121.3938	139.0524	152.3422	173.4464 (45)
Distribution loss (46)m = 0.15 x (45)m	26.3845	23.2164	24.3926	20.8243	19.7580	17.3399	16.7876	17.7213	18.2091	20.8579	22.8513	26.0170 (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												
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 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	49.8615	46.3624	47.1567	48.6218	48.5487	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	226.8553	200.8034	213.5763	188.1439	181.5819	161.9619	159.0741	166.7639	169.9426	190.0113	201.6573	224.4053 (62)
WWHRS	-24.8877	-22.0109	-23.0486	-19.0851	-17.7866	-15.2202	-14.2665	-15.1710	-15.7474	-18.5644	-21.0312	-24.4269 (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	201.9676	178.7924	190.5278	169.0588	163.7952	146.7417	144.8076	151.5930	154.1952	171.4469	180.6260	199.9785 (64)
12Total per year (kWh/year)												2053.5308 (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	71.2253	62.9699	66.8100	58.4894	56.2624	50.0274	49.0017	51.4377	52.5006	58.9746	62.9825	70.4107 (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	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.5605	88.0848	79.5605	82.2125	79.5605	82.2125	79.5605	79.5605	82.2125	79.5605	82.2125	79.5605 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.1138	158.7441	154.6357	145.8893	134.8486	124.4719	117.5396	115.9093	120.0177	128.7641	139.8048	150.1815 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121 (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)	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966 (71)
Water heating gains (Table 5)	95.7329	93.7051	89.7984	81.2352	75.6215	69.4825	65.8625	69.1367	72.9176	79.2670	87.4758	94.6380 (72)
Total internal gains	385.4434	393.5703	377.0308	362.3733	343.0668	326.2032	312.9989	314.6427	325.1840	340.6278	362.5293	377.4162 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
North	3.4500	10.6334	0.6300	0.7000	0.7700	11.2115 (74)						
South	7.6700	46.7521	0.6300	0.7000	0.7700	109.5893 (78)						
Solar gains	120.8007	200.9047	265.0319	316.8750	348.0414	343.4635	331.9219	308.3455	282.5988	219.0894	143.7314	104.0416 (83)
Total gains	506.2441	594.4750	642.0627	679.2482	691.1082	669.6667	644.9207	622.9882	607.7828	559.7172	506.2607	481.4578 (84)

7. Mean internal temperature (heating season)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, n _{li,m} (see Table 9a)													
tau	47.1870	47.2699	47.3514	47.7380	47.8111	48.1540	48.1540	48.2181	48.0214	47.8111	47.6635	47.5103	
alpha	4.1458	4.1513	4.1568	4.1825	4.1874	4.2103	4.2103	4.2145	4.2014	4.1874	4.1776	4.1674	
util living area	0.9868	0.9739	0.9530	0.9051	0.8126	0.6546	0.4950	0.5303	0.7378	0.9153	0.9748	0.9891	(86)
MIT	19.4869	19.7350	20.0408	20.4166	20.7280	20.9212	20.9808	20.9742	20.8647	20.4692	19.9104	19.4408	(87)
Th 2	19.7496	19.7515	19.7533	19.7621	19.7637	19.7714	19.7714	19.7728	19.7684	19.7637	19.7604	19.7569	(88)
util rest of house	0.9826	0.9659	0.9382	0.8744	0.7518	0.5518	0.3642	0.3989	0.6439	0.8813	0.9657	0.9857	(89)
MIT 2	18.0418	18.3549	18.7365	19.1958	19.5432	19.7281	19.7657	19.7644	19.6837	19.2689	18.5859	17.9885	(90)
Living area fraction												f _{LA} = Living area / (4) = 0.4847 (91)	
MIT	18.7422	19.0238	19.3687	19.7875	20.1174	20.3064	20.3547	20.3508	20.2561	19.8506	19.2278	18.6924	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7422	19.0238	19.3687	19.7875	20.1174	20.3064	20.3547	20.3508	20.2561	19.8506	19.2278	18.6924	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9781	0.9600	0.9327	0.8751	0.7708	0.5988	0.4278	0.4626	0.6839	0.8842	0.9606	0.9817	(94)
Useful gains	495.1591	570.6834	598.8321	594.4350	532.7364	401.0127	275.8957	288.2191	415.6519	494.8790	486.3261	472.6351	(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	1101.9826	1075.7978	978.5096	821.1584	633.8929	426.6687	280.7383	295.0091	461.5671	696.6367	916.1362	1098.2887	(97)
Space heating kWh	451.4767	339.4369	282.4801	163.2408	75.2604	0.0000	0.0000	0.0000	0.0000	150.1078	309.4633	465.4863	(98a)
Space heating requirement - total per year (kWh/year)												2236.9523	
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	451.4767	339.4369	282.4801	163.2408	75.2604	0.0000	0.0000	0.0000	0.0000	150.1078	309.4633	465.4863	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2236.9523	
Space heating per m ²												(98c) / (4) = 41.5713 (99)	

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)	
Fraction of space heat from main system(s)												1.0000 (202)	
Efficiency of main space heating system 1 (in %)												92.4000 (206)	
Efficiency of main space heating system 2 (in %)												0.0000 (207)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	451.4767	339.4369	282.4801	163.2408	75.2604	0.0000	0.0000	0.0000	0.0000	150.1078	309.4633	465.4863	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	488.6111	367.3560	305.7144	176.6676	81.4506	0.0000	0.0000	0.0000	0.0000	162.4543	334.9170	503.7731	(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	201.9676	178.7924	190.5278	169.0588	163.7952	146.7417	144.8076	151.5930	154.1952	171.4469	180.6260	199.9785	(64)
Efficiency of water heater (217)m	86.0515	85.7322	85.2235	84.3064	82.8224	80.3000	80.3000	80.3000	80.3000	84.0978	85.5242	86.1280	(216)
Fuel for water heating, kWh/month	234.7055	208.5475	223.5624	200.5290	197.7668	182.7419	180.3333	188.7833	192.0239	203.8661	211.1987	232.1874	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.5311	13.2619	11.9408	8.7484	6.7575	5.5209	6.1644	8.0127	10.4077	13.6555	15.4239	16.9905	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-25.5682	-36.2547	-52.4327	-59.3617	-64.4029	-60.3046	-59.6021	-56.0934	-49.9313	-41.6801	-28.1991	-22.0844	(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	-13.8260	-29.1526	-58.0497	-87.3251	-115.5739	-116.1204	-114.7124	-97.0440	-71.0493	-41.6898	-18.4638	-10.9248	(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												2420.9440 (211)	

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Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	2456.2459 (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)	133.4154 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1329.8470 (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	3766.7584 (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	2420.9440	0.2100	508.3982 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2456.2459	0.2100	515.8116 (264)
Space and water heating			1024.2099 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	133.4154	0.1443	19.2560 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-555.9152	0.1344	-74.7333
PV Unit electricity exported	-773.9319	0.1259	-97.4059
Total			-172.1392 (269)
Total CO2, kg/year			883.2559 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.4100 (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	2420.9440	1.1300	2735.6667 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2456.2459	1.1300	2775.5579 (278)
Space and water heating			5511.2247 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	133.4154	1.5338	204.6371 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-555.9152	1.4968	-832.1117
PV Unit electricity exported	-773.9319	0.4620	-357.5462
Total			-1189.6579 (283)
Total Primary energy kWh/year			4656.3046 (286)
Target Primary Energy Rate (TPER)			86.5300 (287)

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Property Reference	London Road 2		Issued on Date	26/09/2023	
Assessment Reference	02 Be Green	Prop Type Ref			
Property	Flat 2, 39-41, London Road, Enfield, EN2 6LX				
SAP Rating	91 B	DER	1.68	TER	15.80
Environmental	99 A	% DER < TER	89.37		
CO ₂ Emissions (t/year)	0.06	DFEE	47.10	TFEE	47.92
Compliance Check	See BREL	% DFEE < TFEE	1.70		
% DPER < TPER	64.73	DPER	29.36	TPER	83.24
Assessor Details	Mr. Thomas McMahon			Assessor ID	R863-0001
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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.8100 (1b)	2.5000 (2b)	134.5250 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.8100		
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 134.5250 (5)

2. Ventilation rate

	m ³ 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)
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		4.0000 (17)
Infiltration rate		0.2000 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1550 (21)
Wind speed	Jan 5.1000, Feb 5.0000, Mar 4.9000, Apr 4.4000, May 4.3000, Jun 3.8000, Jul 3.8000, Aug 3.7000, Sep 4.0000, Oct 4.3000, Nov 4.5000, Dec 4.7000	(22)
Wind factor	Jan 1.2750, Feb 1.2500, Mar 1.2250, Apr 1.1000, May 1.0750, Jun 0.9500, Jul 0.9500, Aug 0.9250, Sep 1.0000, Oct 1.0750, Nov 1.1250, Dec 1.1750	(22a)
Adj infilt rate	Jan 0.1976, Feb 0.1938, Mar 0.1899, Apr 0.1705, May 0.1666, Jun 0.1473, Jul 0.1473, Aug 0.1434, Sep 0.1550, Oct 0.1666, Nov 0.1744, Dec 0.1821	(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) =		86.4000 (23c)
Effective ac	Jan 0.2656, Feb 0.2617, Mar 0.2579, Apr 0.2385, May 0.2346, Jun 0.2152, Jul 0.2152, Aug 0.2114, Sep 0.2230, Oct 0.2346, Nov 0.2424, Dec 0.2501	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value KJ/m ² K	A x K kJ/K
Glazing (Uw = 1.20)			13.0200	1.1450	14.9084		(27)
Door			2.3300	1.2000	2.7960		(26)
Ground Floor			53.8100	0.1200	6.4572	110.0000	5919.1000 (28a)

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External Walls	78.7000	15.3500	63.3500	0.1800	11.4030	60.0000	3801.0000 (29a)
Flat Roof	14.2600		14.2600	0.1300	1.8538	9.0000	128.3400 (30)
Total net area of external elements Aum(A, m2)			146.7700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.4184		(33)
Party Walls			19.8000	0.0000	0.0000	70.0000	1386.0000 (32)
Party Ceiling 1			39.5500			20.0000	791.0000 (32b)
Internal Walls			60.1000			9.0000	540.9000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12566.3400 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 233.5317 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	7.1000	0.2440	1.7324
E2 Other lintels (including other steel lintels)			
E3 Sill	0.6800	0.0210	0.0143
E4 Jamb	16.1800	0.0160	0.2589
E5 Ground floor (normal)	31.4800	0.0430	1.3536
E15 Flat roof with parapet	10.7000	0.3000	3.2100
E16 Corner (normal)	12.5000	0.0350	0.4375
E7 Party floor between dwellings (in blocks of flats)	20.7800	0.1400	2.9092
P1 Party wall - Ground floor	7.9200	0.0360	0.2851
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.9200	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0710	-0.3550
E25 Staggered party wall between dwellings	5.0000	0.0440	0.2200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.0660 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 47.4844 (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	11.7920	11.6199	11.4479	10.5878	10.4158	9.5556	9.5556	9.3836	9.8997	10.4158	10.7598	11.1039 (38)
Heat transfer coeff	59.2764	59.1044	58.9323	58.0722	57.9002	57.0401	57.0401	56.8680	57.3841	57.9002	58.2442	58.5883 (39)
Average = Sum(39)m / 12 =												58.0292

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1016	1.0984	1.0952	1.0792	1.0760	1.0600	1.0600	1.0568	1.0664	1.0760	1.0824	1.0888 (40)
HLP (average)												1.0784
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8024 (42)

Hot water usage for mixer showers 54.4401 53.6220 52.4298 50.1488 48.4654 46.5882 45.5212 46.7043 48.0013 50.0169 52.3469 54.2315 (42a)

Hot water usage for baths 23.5342 23.1847 22.6925 21.7850 21.1055 20.3520 19.9450 20.4337 20.9659 21.7722 22.6984 23.4547 (42b)

Hot water usage for other uses 33.0885 31.8853 30.6821 29.4789 28.2757 27.0724 27.0724 28.2757 29.4789 30.6821 31.8853 33.0885 (42c)

Average daily hot water use (litres/day) 102.0924 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.0629	108.6920	105.8044	101.4127	97.8466	94.0126	92.5386	95.4137	98.4461	102.4711	106.9306	110.7747 (44)
Energy conte	175.8964	154.7760	162.6174	138.8289	131.7203	115.5995	111.9174	118.1421	121.3938	139.0524	152.3422	173.4464 (45)
Energy content (annual)										Total = Sum(45)m =		1695.7329
Distribution loss (46)m = 0.15 x (45)m	26.3845	23.2164	24.3926	20.8243	19.7580	17.3399	16.7876	17.7213	18.2091	20.8579	22.8513	26.0170 (46)
Water storage loss:												150.0000 (47)
Store volume												1.2500 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6750 (55)
Enter (49) or (54) in (55)												
Total storage loss	20.9250	18.9000	20.9250	20.2500	20.9250	20.2500	20.9250	20.9250	20.2500	20.9250	20.2500	20.9250 (56)
If cylinder contains dedicated solar storage	20.9250	18.9000	20.9250	20.2500	20.9250	20.2500	20.9250	20.9250	20.2500	20.9250	20.2500	20.9250 (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	220.0838	194.6872	206.8048	181.5909	175.9077	158.3615	156.1048	162.3295	164.1558	183.2398	195.1042	217.6338 (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	220.0838	194.6872	206.8048	181.5909	175.9077	158.3615	156.1048	162.3295	164.1558	183.2398	195.1042	217.6338 (64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2216.0039 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	93.8355	83.3920	89.4202	80.3702	79.1469	72.6464	72.5625	74.6322	74.5731	81.5848	84.8634	93.0209 (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
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(66)m	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.2458	87.7365	79.2458	81.8874	79.2458	81.8874	79.2458	79.2458	81.8874	79.2458	81.8874	79.2458	81.8874	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.1138	158.7441	154.6357	145.8893	134.8486	124.4719	117.5396	115.9093	120.0177	128.7641	139.8048	150.1815	150.1815	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	(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	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	(71)
Water heating gains (Table 5)	126.1230	124.0952	120.1885	111.6253	106.3803	100.8978	97.5302	100.3121	103.5737	109.6570	117.8658	125.0280	125.0280	(72)
Total internal gains	412.5188	420.6120	404.1062	389.4382	370.5110	357.2933	344.3519	345.5034	355.5150	367.7032	389.5942	404.4916	404.4916	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North	4.0400	10.6334	0.4000	0.7000	0.7700	8.3357	(74)
South	8.9800	46.7521	0.4000	0.7000	0.7700	81.4645	(78)

Solar gains	89.8002	149.3479	197.0197	235.5610	258.7317	255.3295	246.7491	229.2210	210.0793	162.8663	106.8464	77.3419	(83)
Total gains	502.3190	569.9599	601.1259	624.9992	629.2427	612.6228	591.1010	574.7244	565.5943	530.5695	496.4406	481.8335	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)	58.8877	59.0591	59.2315	60.1088	60.2874	61.1965	61.1965	61.3816	60.8296	60.2874	59.9313	59.5793	21.0000 (85)
tau	4.9258	4.9373	4.9488	5.0073	5.0192	5.0798	5.0798	5.0921	5.0553	5.0192	4.9954	4.9720	
alpha	0.9823	0.9665	0.9407	0.8783	0.7629	0.5778	0.4214	0.4506	0.6609	0.8819	0.9645	0.9852	(86)
util living area	20.1472	20.2993	20.4770	20.6925	20.8449	20.9212	20.9360	20.9350	20.9033	20.7236	20.4098	20.1249	
Living	19.0213	19.2132	19.4340	19.6998	19.8655	19.9453	19.9544	19.9567	19.9274	19.7422	19.3642	19.0017	
Non living	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 16	3	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
16 / 9	20.5637	20.2993	20.4770	20.6925	20.8449	20.9212	20.9360	20.9350	20.9033	20.7236	20.4098	20.2473	(87)
MIT	19.9995	20.0021	20.0048	20.0178	20.0205	20.0336	20.0336	20.0362	20.0284	20.0205	20.0152	20.0100	(88)
Th 2	0.9773	0.9576	0.9248	0.8468	0.7069	0.4979	0.3305	0.3585	0.5822	0.8452	0.9535	0.9810	(89)
util rest of house	19.6095	19.2132	19.4340	19.6998	19.8655	19.9453	19.9544	19.9567	19.9274	19.7422	19.3642	19.1834	(90)
MIT 2	20.0720	19.7396	19.9395	20.1809	20.3402	20.4183	20.4301	20.4308	20.4003	20.2179	19.8709	0.4847	(91)
Living area fraction	20.0720	19.7396	19.9395	20.1809	20.3402	20.4183	20.4301	20.4308	20.4003	20.2179	19.8709	19.6991	(92)
MIT	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(93)
Temperature adjustment	20.0720	19.7396	19.9395	20.1809	20.3402	20.4183	20.4301	20.4308	20.4003	20.2179	19.8709	19.6991	(93)
adjusted MIT													

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9777	0.9548	0.9236	0.8525	0.7262	0.5304	0.3681	0.3966	0.6135	0.8534	0.9516	0.9794	(94)
Useful gains	491.1394	544.2059	555.2168	532.8181	456.9494	324.9510	217.5916	227.9420	346.9914	452.7707	472.4078	471.9245	(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	934.9071	877.0846	792.0204	655.1076	500.2665	331.8749	218.4711	229.2247	361.5397	556.8759	743.8339	908.0628	(97)
Space heating kWh	330.1632	223.6945	176.1819	88.0485	32.2279	0.0000	0.0000	0.0000	0.0000	77.4543	195.4268	324.4869	(98a)
Space heating requirement - total per year (kWh/year)												1447.6840	
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	330.1632	223.6945	176.1819	88.0485	32.2279	0.0000	0.0000	0.0000	0.0000	77.4543	195.4268	324.4869	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1447.6840	
Space heating per m2										(98c) / (4) =		26.9036	(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 %)													265.8635 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)

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Space heating requirement	330.1632	223.6945	176.1819	88.0485	32.2279	0.0000	0.0000	0.0000	0.0000	77.4543	195.4268	324.4869	(98)
Space heating efficiency (main heating system 1)	265.8635	265.8635	265.8635	265.8635	265.8635	0.0000	0.0000	0.0000	0.0000	265.8635	265.8635	265.8635	(210)
Space heating fuel (main heating system)	124.1852	84.1388	66.2678	33.1179	12.1220	0.0000	0.0000	0.0000	0.0000	29.1331	73.5064	122.0502	(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 requirement	220.0838	194.6872	206.8048	181.5909	175.9077	158.3615	156.1048	162.3295	164.1558	183.2398	195.1042	217.6338	(64)
Efficiency of water heater (217)m	191.0370	191.0370	191.0370	191.0370	191.0370	191.0370	191.0370	191.0370	191.0370	191.0370	191.0370	191.0370	(216)
Fuel for water heating, kWh/month	115.2048	101.9107	108.2538	95.0553	92.0804	82.8957	81.7145	84.9728	85.9288	95.9185	102.1290	113.9224	(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	11.7088	10.5757	11.7088	11.3311	11.7088	11.3311	11.7088	11.3311	11.7088	11.3311	11.7088	11.3311	(231)
Lighting	16.4657	13.2094	11.8936	8.7138	6.7308	5.4991	6.1400	7.9810	10.3666	13.6015	15.3629	16.9234	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-32.3101	-47.2869	-70.2709	-80.2446	-87.0704	-80.6510	-79.6472	-74.4573	-64.7730	-53.7655	-35.7917	-27.6834	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-11.7660	-26.2634	-54.9938	-87.6348	-120.3304	-123.2571	-121.5661	-101.3438	-72.9145	-40.2589	-16.4890	-9.2008	(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												544.5215	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												191.0370	(216)
Water heating fuel used												1159.9868	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400) mechanical ventilation fans (SFP = 0.8400)												137.8612	(230a)
Total electricity for the above, kWh/year												137.8612	(231)
Electricity for lighting (calculated in Appendix L)												132.8878	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1519.9707	(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												455.2867	(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	544.5215	0.1563	85.1351 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1159.9868	0.1409	163.4483 (264)
Space and water heating			248.5834 (265)
Pumps, fans and electric keep-hot	137.8612	0.1387	19.1231 (267)
Energy for lighting	132.8878	0.1443	19.1798 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-733.9520	0.1343	-98.5417
PV Unit electricity exported	-786.0187	0.1243	-97.7007
Total			-196.2424 (269)
Total CO2, kg/year			90.6438 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6800 (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	544.5215	1.5788	859.6893 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1159.9868	1.5210	1764.3596 (278)

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Space and water heating			2624.0489 (279)
Pumps, fans and electric keep-hot	137.8612	1.5128	208.5565 (281)
Energy for lighting	132.8878	1.5338	203.8277 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-733.9520	1.4962	-1098.1373
PV Unit electricity exported	-786.0187	0.4562	-358.5736
Total			-1456.7109 (283)
Total Primary energy kWh/year			1579.7223 (286)
Dwelling Primary energy Rate (DPER)			29.3600 (287)

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

 1. Overall dwelling characteristics

		Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor		53.8100 (1b)	x 2.5000 (2b)	= 134.5250 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.8100			(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	134.5250 (5)

 2. Ventilation rate

			m ³ per hour
Number of open chimneys		0 * 80 =	0.0000 (6a)
Number of open flues		0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000 (6d)
Number of flues attached to other heater		0 * 35 =	0.0000 (6e)
Number of blocked chimneys		0 * 20 =	0.0000 (6f)
Number of intermittent extract fans		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.1487 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3987 (18)
Number of sides sheltered			3 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.3090 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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												
Effective ac	0.3939	0.3862	0.3785	0.3399	0.3321	0.2935	0.2935	0.2858	0.3090	0.3321	0.3476	0.3630 (22b)
	0.5776	0.5746	0.5716	0.5578	0.5552	0.5431	0.5431	0.5408	0.5477	0.5552	0.5604	0.5659 (25)

 3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.3300	1.0000	2.3300		(26)
TER Opening Type (Uw = 1.20)			11.1200	1.1450	12.7328		(27)
Ground Floor			53.8100	0.1300	6.9953		(28a)
External Walls	78.7000	13.4500	65.2500	0.1800	11.7450		(29a)
Flat Roof	14.2600		14.2600	0.1100	1.5686		(30)
Total net area of external elements Aum(A, m ²)			146.7700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.3717		(33)
Party Walls			19.8000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 240.8816 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	7.1000	0.0500	0.3550
E3 Sill	0.6800	0.0500	0.0340
E4 Jamb	16.1800	0.0500	0.8090
E5 Ground floor (normal)	31.4800	0.1600	5.0368

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E15 Flat roof with parapet	10.7000	0.5600	5.9920
E16 Corner (normal)	12.5000	0.0900	1.1250
E7 Party floor between dwellings (in blocks of flats)	20.7800	0.0700	1.4546
P1 Party wall - Ground floor	7.9200	0.0800	0.6336
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.9200	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	5.0000	-0.0900	-0.4500
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			15.2900 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	50.6617 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	25.6412	25.5075	25.3764	24.7606	24.6453	24.1090	24.1090	24.0096	24.3156	24.6453	24.8784	25.1221 (38)
Average = Sum(39)m / 12 =	76.3030	76.1692	76.0381	75.4223	75.3071	74.7707	74.7707	74.6714	74.9773	75.3071	75.5401	75.7838 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.4180	1.4155	1.4131	1.4016	1.3995	1.3895	1.3895	1.3877	1.3934	1.3995	1.4038	1.4084 (40)
HLP (average)												1.4016
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.8024 (42)
Hot water usage for mixer showers	54.4401	53.6220	52.4298	50.1488	48.4654	46.5882	45.5212	46.7043	48.0013	50.0169	52.3469	54.2315	54.2315 (42a)
Hot water usage for baths	23.5342	23.1847	22.6925	21.7850	21.1055	20.3520	19.9450	20.4337	20.9659	21.7722	22.6984	23.4547	23.4547 (42b)
Hot water usage for other uses	33.0885	31.8853	30.6821	29.4789	28.2757	27.0724	27.0724	28.2757	29.4789	30.6821	31.8853	33.0885	33.0885 (42c)
Average daily hot water use (litres/day)													102.0924 (43)
Daily hot water use	111.0629	108.6920	105.8044	101.4127	97.8466	94.0126	92.5386	95.4137	98.4461	102.4711	106.9306	110.7747	110.7747 (44)
Energy content (annual)	175.8964	154.7760	162.6174	138.8289	131.7203	115.5995	111.9174	118.1421	121.3938	139.0524	152.3422	173.4464	173.4464 (45)
Distribution loss (46)m = 0.15 x (45)m	26.3845	23.2164	24.3926	20.8243	19.7580	17.3399	16.7876	17.7213	18.2091	20.8579	22.8513	26.0170	26.0170 (46)
Water storage loss:													150.0000 (47)
Store volume													1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):													0.5400 (49)
Temperature factor from Table 2b													0.7527 (55)
Enter (49) or (54) in (55)													
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	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	0.0000 (61)
Total heat required for water heating calculated for each month	222.4913	196.8617	209.2123	183.9207	178.3152	160.6913	158.5123	164.7370	166.4857	185.6473	197.4340	220.0413	220.0413 (62)
WWHRS	-24.8877	-22.0109	-23.0486	-19.0851	-17.7866	-15.2202	-14.2665	-15.1710	-15.7474	-18.5644	-21.0312	-24.4269	-24.4269 (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	-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	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	0.0000 (63d)
Output from w/h	197.6036	174.8508	186.1638	164.8356	160.5286	145.4712	144.2459	149.5661	150.7383	167.0829	176.4028	195.6145	195.6145 (64)
Total per year (kWh/year)													2013.1039 (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	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	95.7615	85.1316	91.3462	82.2341	81.0729	74.5103	74.4885	76.5582	76.4369	83.5108	86.7273	94.9469	94.9469 (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	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207	90.1207 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.5605	88.0848	79.5605	82.2125	79.5605	82.2125	79.5605	79.5605	82.2125	79.5605	82.2125	79.5605 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.1138	158.7441	154.6357	145.8893	134.8486	124.4719	117.5396	115.9093	120.0177	128.7641	139.8048	150.1815 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121	32.0121 (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)	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966	-72.0966 (71)
Water heating gains (Table 5)	128.7117	126.6839	122.7772	114.2140	108.9690	103.4865	100.1189	102.9008	106.1624	112.2457	120.4545	127.6168 (72)
Total internal gains	418.4221	426.5491	410.0096	395.3520	376.4143	360.2072	347.2553	348.4068	358.4288	373.6065	395.5080	410.3949 (73)

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W		
North				3.4500	10.6334	0.6300		0.7000	0.7700	11.2115 (74)		
South				7.6700	46.7521	0.6300		0.7000	0.7700	109.5893 (78)		
Solar gains	120.8007	200.9047	265.0319	316.8750	348.0414	343.4635	331.9219	308.3455	282.5988	219.0894	143.7314	104.0416 (83)
Total gains	539.2229	627.4537	675.0414	712.2270	724.4557	703.6707	679.1771	656.7522	641.0276	592.6959	539.2395	514.4366 (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	47.1870	47.2699	47.3514	47.7380	47.8111	48.1540	48.1540	48.2181	48.0214	47.8111	47.6635	47.5103
alpha	4.1458	4.1513	4.1568	4.1825	4.1874	4.2103	4.2103	4.2145	4.2014	4.1874	4.1776	4.1674
util living area	0.9835	0.9688	0.9452	0.8924	0.7933	0.6305	0.4723	0.5062	0.7129	0.9009	0.9690	0.9862 (86)
MIT	19.5470	19.7915	20.0919	20.4573	20.7538	20.9315	20.9839	20.9783	20.8816	20.5117	19.9671	19.5017 (87)
Th 2	19.7496	19.7515	19.7533	19.7621	19.7637	19.7714	19.7714	19.7728	19.7684	19.7637	19.7604	19.7569 (88)
util rest of house	0.9784	0.9595	0.9285	0.8590	0.7302	0.5287	0.3464	0.3793	0.6179	0.8633	0.9580	0.9820 (89)
MIT 2	18.1174	18.4246	18.7977	19.2407	19.5670	19.7345	19.7667	19.7659	19.6957	19.3150	18.6555	18.0653 (90)
Living area fraction	fLA = Living area / (4) = 0.4847 (91)											
MIT	18.8103	19.0871	19.4250	19.8303	20.1422	20.3146	20.3566	20.3535	20.2705	19.8950	19.2912	18.7615 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.8103	19.0871	19.4250	19.8303	20.1422	20.3146	20.3566	20.3535	20.2705	19.8950	19.2912	18.7615 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9734	0.9533	0.9232	0.8611	0.7512	0.5757	0.4076	0.4409	0.6592	0.8679	0.9527	0.9774 (94)
Useful gains	524.8559	598.1240	623.2132	613.3057	544.2155	405.0930	276.8438	289.5362	422.5909	514.4049	513.7540	502.7965 (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	1107.1759	1080.6216	982.7911	824.3917	635.7574	427.2883	280.8868	295.2128	462.6462	699.9784	920.9225	1103.5247 (97)
Space heating kWh	433.2461	324.2384	267.5260	151.9819	68.1072	0.0000	0.0000	0.0000	0.0000	138.0667	293.1613	446.9418 (98a)
Space heating requirement - total per year (kWh/year)												2123.2694
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	433.2461	324.2384	267.5260	151.9819	68.1072	0.0000	0.0000	0.0000	0.0000	138.0667	293.1613	446.9418 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2123.2694
Space heating per m2												(98c) / (4) = 39.4586 (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	433.2461	324.2384	267.5260	151.9819	68.1072	0.0000	0.0000	0.0000	0.0000	138.0667	293.1613	446.9418 (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)	469.3890	351.2876	289.8440	164.6608	73.7889	0.0000	0.0000	0.0000	0.0000	149.5847	317.6179	484.2274 (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	197.6036	174.8508	186.1638	164.8356	160.5286	145.4712	144.2459	149.5661	150.7383	167.0829	176.4028	195.6145 (64)
Efficiency of water heater (217)m	85.7700	85.4247	84.8723	83.8781	82.2842	79.8000	79.8000	79.8000	79.8000	83.6353	85.1905	79.8000 (216)
Fuel for water heating, kWh/month	230.3878	204.6841	219.3458	196.5180	195.0903	182.2947	180.7592	187.4262	188.8951	199.7756	207.0685	85.8523 (217)
Space cooling fuel requirement												

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(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	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.5311	13.2619	11.9408	8.7484	6.7575	5.5209	6.1644	8.0127	10.4077	13.6555	15.4239	16.9905	16.9905	(232)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-25.5682	-36.2547	-52.4327	-59.3617	-64.4029	-60.3046	-59.6021	-56.0934	-49.9313	-41.6801	-28.1991	-22.0844	-22.0844	(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	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	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	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)m	-13.8260	-29.1526	-58.0497	-87.3251	-115.5739	-116.1204	-114.7124	-97.0440	-71.0493	-41.6898	-18.4638	-10.9248	-10.9248	(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	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	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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													2300.4002	(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													2420.0953	(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)													133.4154	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-1329.8470	(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													3610.0640	(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	2300.4002	0.2100	483.0840 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2420.0953	0.2100	508.2200 (264)
Space and water heating			991.3041 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	133.4154	0.1443	19.2560 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-555.9152	0.1344	-74.7333
PV Unit electricity exported	-773.9319	0.1259	-97.4059
Total			-172.1392 (269)
Total CO2, kg/year			850.3501 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.8000 (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	2300.4002	1.1300	2599.4523 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2420.0953	1.1300	2734.7077 (278)
Space and water heating			5334.1600 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	133.4154	1.5338	204.6371 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-555.9152	1.4968	-832.1117
PV Unit electricity exported	-773.9319	0.4620	-357.5462
Total			-1189.6579 (283)
Total Primary energy kWh/year			4479.2400 (286)
Target Primary Energy Rate (TPER)			83.2400 (287)

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Property Reference	London Road 3		Issued on Date	26/09/2023	
Assessment Reference	01 Be Lean	Prop Type Ref			
Property	Flat 3, 39-41, London Road, Enfield, EN2 6LX				
SAP Rating	82 B	DER	16.63	TER	14.68
Environmental	85 B	% DER < TER			-13.28
CO ₂ Emissions (t/year)	1.43	DFEE	54.23	TREE	55.45
Compliance Check	See BREL	% DFEE < TREE			2.19
% DPER < TPER	-21.95	DPER	94.08	TPER	77.15
Assessor Details	Mr. Thomas McMahon			Assessor ID	R863-0001
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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	8.5400 (1b)	x 2.8700 (2b)	= 24.5098 (1b)
First floor	89.5000 (1c)	x 2.8100 (2c)	= 251.4950 (1c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	98.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 276.0048 (5)

2. Ventilation rate

	m ³ 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)

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		4.0000 (17)
Infiltration rate		0.2000 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1550 (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	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												84.6000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2746	0.2707	0.2669	0.2475	0.2436	0.2242	0.2242	0.2204	0.2320	0.2436	0.2514	0.2591 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Glazing (Uw = 1.20)			28.3500	1.1450	32.4618		(27)
Door			2.3300	1.2000	2.7960		(26)

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Ground Floor			8.5400	0.1200	1.0248	110.0000	939.4000 (28a)
Exposed Floor			4.3700	0.1600	0.6992	20.0000	87.4000 (28b)
External Walls	135.4200	30.6800	104.7400	0.1800	18.8532	60.0000	6284.4000 (29a)
Flat Roof	89.5000		89.5000	0.1300	11.6350	9.0000	805.5000 (30)
Total net area of external elements Aum(A, m2)			237.8300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	67.4700		(33)
Party Walls			24.4200	0.0000	0.0000	70.0000	1709.4000 (32)
Party Floor 1			76.5900			30.0000	2297.7000 (32d)
Internal Walls			164.5000			9.0000	1480.5000 (32c)
Internal Floor 1			8.5400			18.0000	153.7200 (32d)
Internal Ceiling 1			8.5400			9.0000	76.8600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13834.8800 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 141.1146 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	15.1200	0.2440	3.6893
E3 Sill	3.1600	0.0210	0.0664
E4 Jamb	41.9400	0.0160	0.6710
E5 Ground floor (normal)	4.8200	0.0430	0.2073
E15 Flat roof with parapet	48.3100	0.3000	14.4930
E16 Corner (normal)	14.5000	0.0350	0.5075
E7 Party floor between dwellings (in blocks of flats)	26.4300	0.1400	3.7002
P1 Party wall - Ground floor	8.5100	0.0360	0.3064
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.5100	0.0000	0.0000
E18 Party wall between dwellings	2.8700	0.0550	0.1579
E6 Intermediate floor within a dwelling	2.8500	0.0010	0.0029
E20 Exposed floor (normal)	2.2200	0.0380	0.0844
E17 Corner (inverted - internal area greater than external area)	5.5000	-0.0710	-0.3905
E21 Exposed floor (inverted)	1.9700	0.3200	0.6304
E24 Eaves (insulation at ceiling level - inverted)	16.8100	0.1500	2.5215

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 26.6475 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 94.1175 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	25.0133	24.6603	24.3074	22.5427	22.1898	20.4250	20.4250	20.0721	21.1309	22.1898	22.8956	23.6015 (38)
Average = Sum(39)m / 12 =	119.1308	118.7778	118.4249	116.6602	116.3072	114.5425	114.5425	114.1896	115.2484	116.3072	117.0131	117.7190 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2151	1.2115	1.2079	1.1899	1.1863	1.1683	1.1683	1.1647	1.1755	1.1863	1.1935	1.2007 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7206 (42)											
Hot water usage for mixer showers	69.8357	68.7862	67.2569	64.3308	62.1715	59.7634	58.3946	59.9123	61.5761	64.1616	67.1506	69.5682 (42a)
Hot water usage for baths	30.1549	29.7070	29.0764	27.9136	27.0429	26.0774	25.5559	26.1821	26.8640	27.8971	29.0838	30.0529 (42b)
Hot water usage for other uses	42.4919	40.9468	39.4016	37.8564	36.3113	34.7661	34.7661	36.3113	37.8564	39.4016	40.9468	42.4919 (42c)
Average daily hot water use (litres/day)												130.9735 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	142.4825	139.4400	135.7349	130.1008	125.5256	120.6069	118.7166	122.4057	126.2965	131.4603	137.1812	142.1130 (44)
Energy content (annual)	225.6575	198.5607	208.6195	178.1015	168.9816	148.3002	143.5774	151.5639	155.7362	178.3904	195.4397	222.5146 (45)
Distribution loss (46)m = 0.15 x (45)m	33.8486	29.7841	31.2929	26.7152	25.3472	22.2450	21.5366	22.7346	23.3604	26.7586	29.3160	33.3772 (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 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 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 0.0000 (59)

Combi loss 31.0010 27.9967 30.9874 29.9688 30.9557 29.9449 30.9354 30.9418 29.9509 30.9632 29.9827 30.9985 (61)

Total heat required for water heating calculated for each month 256.6585 226.5575 239.6069 208.0703 199.9373 178.2451 174.5128 182.5056 185.6871 209.3536 225.4224 253.5132 (62)

WVHRS 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 256.6585 226.5575 239.6069 208.0703 199.9373 178.2451 174.5128 182.5056 185.6871 209.3536 225.4224 253.5132 (64)

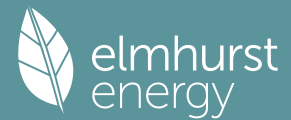
Total per year (kWh/year) = Sum(64)m = 2540.0704 (64)

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 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 82.7814 73.0206 77.1128 66.7110 63.9253 56.7961 55.4733 58.1304 59.2700 67.0556 72.4794 81.7357 (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	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	127.6698	141.3487	127.6698	131.9255	127.6698	131.9255	127.6698	127.6698	131.9255	127.6698	131.9255	127.6698 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	253.1196	255.7462	249.1273	235.0364	217.2492	200.5317	189.3634	186.7368	193.3557	207.4466	225.2338	241.9513 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031 (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)	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250 (71)
Water heating gains (Table 5)	111.2653	108.6617	103.6463	92.6541	85.9211	78.8834	74.5609	78.1323	82.3195	90.1285	100.6658	109.8599 (72)
Total internal gains	558.8641	572.5660	547.2528	526.4254	497.6495	475.1499	455.4035	456.3483	471.4100	492.0543	524.6345	546.2904 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W						
North	11.5900	10.6334	0.4000	0.7000	0.7700	23.9137 (74)						
South	11.6300	46.7521	0.4000	0.7000	0.7700	105.5047 (78)						
West	5.1300	19.6403	0.4000	0.7000	0.7700	19.5504 (80)						
Solar gains	148.9688	256.7345	360.7428	465.3576	539.8331	544.5935	521.4048	464.1972	396.5440	286.1505	178.9367	127.1787 (83)
Total gains	707.8329	829.3005	907.9955	991.7830	1037.4826	1019.7434	976.8083	920.5454	867.9540	778.2048	703.5712	673.4691 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
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	32.2589	32.3547	32.4511	32.9420	33.0420	33.5510	33.5510	33.6547	33.3456	33.0420	32.8427	32.6457
alpha	3.1506	3.1570	3.1634	3.1961	3.2028	3.2367	3.2367	3.2436	3.2230	3.2028	3.1895	3.1764
util living area	0.9748	0.9582	0.9325	0.8754	0.7777	0.6267	0.4847	0.5269	0.7288	0.8970	0.9596	0.9782 (86)
MIT	19.3061	19.5282	19.8314	20.2317	20.5637	20.7880	20.8670	20.8550	20.7026	20.2706	19.7280	19.2766 (87)
Th 2	19.9079	19.9108	19.9137	19.9281	19.9310	19.9454	19.9454	19.9483	19.9396	19.9310	19.9252	19.9194 (88)
util rest of house	0.9699	0.9502	0.9191	0.8499	0.7306	0.5484	0.3805	0.4224	0.6589	0.8705	0.9505	0.9740 (89)
MIT 2	17.9339	18.2159	18.5981	19.1005	19.4910	19.7388	19.8052	19.8005	19.6561	19.1598	18.4823	17.9048 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.3276	18.5925	18.9520	19.4250	19.7988	20.0398	20.1098	20.1031	19.9563	19.4785	18.8397	18.2984 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.3276	18.5925	18.9520	19.4250	19.7988	20.0398	20.1098	20.1031	19.9563	19.4785	18.8397	18.2984 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9604	0.9378	0.9044	0.8358	0.7240	0.5559	0.3976	0.4387	0.6601	0.8568	0.9385	0.9653 (94)
Useful gains	679.7964	777.6821	821.2243	828.9384	751.1859	566.9193	388.3413	403.8206	572.9525	666.7793	660.3286	650.1220 (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	1671.1235	1626.3625	1474.6228	1227.8533	941.9493	623.0924	402.0256	422.8543	674.9325	1032.6334	1373.6992	1659.6519 (97)
Space heating kWh	737.5473	570.3133	486.1284	287.2187	141.9280	0.0000	0.0000	0.0000	0.0000	272.1954	513.6269	751.0903 (98a)
Space heating requirement - total per year (kWh/year)												3760.0484
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	737.5473	570.3133	486.1284	287.2187	141.9280	0.0000	0.0000	0.0000	0.0000	272.1954	513.6269	751.0903 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3760.0484
Space heating per m2												(98c) / (4) = 38.3522 (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 %)												83.7000 (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

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Space heating requirement	737.5473	570.3133	486.1284	287.2187	141.9280	0.0000	0.0000	0.0000	0.0000	272.1954	513.6269	751.0903 (98)
Space heating efficiency (main heating system 1)	83.7000	83.7000	83.7000	83.7000	83.7000	0.0000	0.0000	0.0000	0.0000	83.7000	83.7000	83.7000 (210)
Space heating fuel (main heating system)	881.1796	681.3779	580.7986	343.1526	169.5675	0.0000	0.0000	0.0000	0.0000	325.2036	613.6522	897.3600 (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 requirement	256.6585	226.5575	239.6069	208.0703	199.9373	178.2451	174.5128	182.5056	185.6871	209.3536	225.4224	253.5132 (64)
Efficiency of water heater (217)m	88.5704	88.5573	88.5343	88.4893	88.4069	88.2000	88.2000	88.2000	88.2000	88.4819	88.5469	88.2000 (216)
Fuel for water heating, kWh/month	289.7792	255.8316	270.6374	235.1362	226.1558	202.0920	197.8603	206.9225	210.5296	236.6061	254.5797	286.2185 (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 (235c)m	30.1258	27.2104	30.1258	29.1540	30.1258	29.1540	30.1258	30.1258	29.1540	30.1258	29.1540	30.1258 (231)
Lighting (233a)m	29.5067	23.6714	21.3135	15.6151	12.0616	9.8544	11.0030	14.3021	18.5770	24.3740	27.5304	30.3268 (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												4492.2919 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												88.2000
Water heating fuel used												2872.3488 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7980)												
mechanical ventilation fans (SFP = 0.7980)												268.7072 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												354.7072 (231)
Electricity for lighting (calculated in Appendix L)												238.1361 (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												7957.4841 (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	4492.2919	0.2100	943.3813 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2872.3488	0.2100	603.1933 (264)
Space and water heating			1546.5746 (265)
Pumps, fans and electric keep-hot	354.7072	0.1387	49.2023 (267)
Energy for lighting	238.1361	0.1443	34.3704 (268)
Total CO2, kg/year			1630.1472 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			16.6300 (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	4492.2919	1.1300	5076.2899 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2872.3488	1.1300	3245.7542 (278)
Space and water heating			8322.0441 (279)
Pumps, fans and electric keep-hot	354.7072	1.5128	536.6011 (281)
Energy for lighting	238.1361	1.5338	365.2611 (282)

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Total Primary energy kWh/year
Dwelling Primary energy Rate (DPER)

9223.9062 (286)
94.0800 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	8.5400 (1b)	x 2.8700 (2b)	= 24.5098 (1b)
First floor	89.5000 (1c)	x 2.8100 (2c)	= 251.4950 (1c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	98.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 276.0048 (5)

2. Ventilation rate

	m ³ 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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1087 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3587 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2780 (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	0.3544	0.3475	0.3405	0.3058	0.2988	0.2641	0.2641	0.2571	0.2780	0.2988	0.3127	0.3266 (22b)
Effective ac	0.5628	0.5604	0.5580	0.5468	0.5447	0.5349	0.5349	0.5331	0.5386	0.5447	0.5489	0.5533 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.3300	1.0000	2.3300		(26)
TER Opening Type (Uw = 1.20)			22.1800	1.1450	25.3969		(27)
Ground Floor			8.5400	0.1300	1.1102		(28a)
Exposed Floor			4.3700	0.1300	0.5681		(28b)
External Walls	135.4200	24.5100	110.9100	0.1800	19.9638		(29a)
Flat Roof	89.5000		89.5000	0.1100	9.8450		(30)
Total net area of external elements Aum(A, m ²)			237.8300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.2140		(33)
Party Walls			24.4200	0.0000	0.0000		(32)

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

141.1146 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	15.1200	0.0500	0.7560
E3 Sill	3.1600	0.0500	0.1580
E4 Jamb	41.9400	0.0500	2.0970
E5 Ground floor (normal)	4.8200	0.1600	0.7712
E15 Flat roof with parapet	48.3100	0.5600	27.0536
E16 Corner (normal)	14.5000	0.0900	1.3050
E7 Party floor between dwellings (in blocks of flats)	26.4300	0.0700	1.8501
P1 Party wall - Ground floor	8.5100	0.0800	0.6808
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.5100	0.0000	0.0000
E18 Party wall between dwellings	2.8700	0.0600	0.1722

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E6 Intermediate floor within a dwelling	2.8500	0.0000	0.0000	
E20 Exposed floor (normal)	2.2200	0.3200	0.7104	
E17 Corner (inverted - internal area greater than external area)	5.5000	-0.0900	-0.4950	
E21 Exposed floor (inverted)	1.9700	0.3200	0.6304	
E24 Eaves (insulation at ceiling level - inverted)	16.8100	0.2400	4.0344	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				39.7241 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		98.9381 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(38)
Heat transfer coeff	51.2618	51.0396	50.8219	49.7991	49.6077	48.7169	48.7169	48.5520	49.0601	49.6077	49.9949	50.3996	
Average = Sum(39)m / 12 =	150.1999	149.9778	149.7600	148.7372	148.5459	147.6551	147.6551	147.4901	147.9982	148.5459	148.9330	149.3377	148.7363 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.5320	1.5298	1.5275	1.5171	1.5152	1.5061	1.5061	1.5044	1.5096	1.5152	1.5191	1.5232	1.5171 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kwh/year)

Assumed occupancy													2.7206 (42)
Hot water usage for mixer showers													
69.8357	68.7862	67.2569	64.3308	62.1715	59.7634	58.3946	59.9123	61.5761	64.1616	67.1506	69.5682		69.5682 (42a)
Hot water usage for baths													
30.1549	29.7070	29.0764	27.9136	27.0429	26.0774	25.5559	26.1821	26.8640	27.8971	29.0838	30.0529		30.0529 (42b)
Hot water usage for other uses													
42.4919	40.9468	39.4016	37.8564	36.3113	34.7661	34.7661	36.3113	37.8564	39.4016	40.9468	42.4919		42.4919 (42c)
Average daily hot water use (litres/day)													130.9735 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
142.4825	139.4400	135.7349	130.1008	125.5256	120.6069	118.7166	122.4057	126.2965	131.4603	137.1812	142.1130		142.1130 (44)
Energy cont	225.6575	198.5607	208.6195	178.1015	168.9816	148.3002	143.5774	151.5639	155.7362	178.3904	195.4397	222.5146	222.5146 (45)
Energy content (annual)												Total = Sum(45)m = 2175.4433	
Distribution loss (46)m = 0.15 x (45)m	33.8486	29.7841	31.2929	26.7152	25.3472	22.2450	21.5366	22.7346	23.3604	26.7586	29.3160	33.3772	33.3772 (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	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	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	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589 (61)
Total heat required for water heating calculated for each month	276.6164	244.5881	259.5784	227.4166	219.9405	197.6153	194.5363	202.5228	205.0513	229.3493	244.7548	273.4735	273.4735 (62)
WVHRS	-31.9260	-28.2356	-29.5667	-24.4824	-22.8167	-19.5244	-18.3010	-19.4613	-20.2007	-23.8144	-26.9788	-31.3348	-31.3348 (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	-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	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	0.0000 (63d)
Output from w/h	244.6904	216.3525	230.0117	202.9342	197.1238	178.0909	176.2353	183.0615	184.8506	205.5349	217.7760	242.1388	242.1388 (64)
												Total per year (kWh/year) = Sum(64)m = 2478.8005 (64)	
12Total per year (kWh/year)													2479 (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	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	87.7708	77.5283	82.1057	71.5475	68.9261	61.6386	60.4792	63.1347	64.1111	72.0545	77.3125	86.7258	86.7258 (65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	127.6458	141.3222	127.6458	131.9007	127.6458	131.9007	127.6458	127.6458	131.9007	127.6458	131.9007	127.6458	127.6458 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	253.1196	255.7462	249.1273	235.0364	217.2492	200.5317	189.3634	186.7368	193.3557	207.4466	225.2338	241.9513	241.9513 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031 (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	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250 (71)
Water heating gains (Table 5)	117.9716	115.3695	110.3571	99.3716	92.6426	85.6091	81.2893	84.8585	89.0431	96.8475	107.3784	116.5670	116.5670 (72)
Total internal gains	565.5464	579.2473	553.9397	533.1181	504.3470	481.8509	462.1079	463.0505	478.1089	498.7493	531.3224	552.9735	552.9735 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2				Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		Factor Table 6d	W	
North	9.0700				10.6334	0.6300		0.7000		0.7700	29.4748 (74)	
South	9.1000				46.7521	0.6300		0.7000		0.7700	130.0212 (78)	
West	4.0100				19.6403	0.6300		0.7000		0.7700	24.0693 (80)	
Solar gains	183.5653	316.3537	444.5058	573.4030	665.1667	671.0320	642.4597	571.9714	488.6163	352.5979	220.4920	156.7153 (83)
Total gains	749.1117	895.6009	998.4454	1106.5211	1169.5137	1152.8830	1104.5676	1035.0219	966.7252	851.3472	751.8143	709.6889 (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	25.5860	25.6239	25.6612	25.8377	25.8709	26.0270	26.0270	26.0561	25.9667	25.8709	25.8037	25.7338
alpha	2.7057	2.7083	2.7107	2.7225	2.7247	2.7351	2.7351	2.7371	2.7311	2.7247	2.7202	2.7156
util living area	0.9730	0.9560	0.9304	0.8775	0.7892	0.6560	0.5224	0.5660	0.7517	0.9007	0.9585	0.9765 (86)
MIT	18.3174	18.6492	19.1246	19.7459	20.3058	20.7136	20.8897	20.8593	20.5535	19.8220	18.9589	18.2564 (87)
Th 2	19.6636	19.6653	19.6669	19.6747	19.6762	19.6830	19.6830	19.6842	19.6803	19.6762	19.6732	19.6701 (88)
util rest of house	0.9673	0.9468	0.9152	0.8491	0.7363	0.5631	0.3899	0.4349	0.6721	0.8715	0.9483	0.9716 (89)
MIT 2	16.6013	17.0203	17.6177	18.3871	19.0472	19.4856	19.6351	19.6175	19.3376	18.4983	17.4226	16.5278 (90)
Living area fraction	fLA = Living area / (4) =											0.2869 (91)
MIT	17.0937	17.4877	18.0500	18.7770	19.4083	19.8379	19.9951	19.9738	19.6865	18.8781	17.8634	17.0238 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.0937	17.4877	18.0500	18.7770	19.4083	19.8379	19.9951	19.9738	19.6865	18.8781	17.8634	17.0238 (93)
8. Space heating requirement												
Utilisation	0.9508	0.9256	0.8904	0.8250	0.7237	0.5752	0.4237	0.4664	0.6725	0.8485	0.9280	0.9564 (94)
Useful gains	712.2592	828.9325	889.0368	912.8481	846.4261	663.1614	468.0075	482.7390	650.1350	722.3797	697.6778	678.7665 (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	1921.6100	1887.8724	1729.7335	1469.0764	1145.0379	773.4075	501.2988	527.0979	826.7895	1229.6798	1603.0202	1915.0736 (97)
Space heating kWh	899.7570	711.6076	625.4783	400.4844	222.1672	0.0000	0.0000	0.0000	0.0000	377.4312	651.8465	919.8125 (98a)
Space heating requirement - total per year (kWh/year)												4808.5847
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	899.7570	711.6076	625.4783	400.4844	222.1672	0.0000	0.0000	0.0000	0.0000	377.4312	651.8465	919.8125 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4808.5847
Space heating per m2												(98c) / (4) = 49.0472 (99)
9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	899.7570	711.6076	625.4783	400.4844	222.1672	0.0000	0.0000	0.0000	0.0000	377.4312	651.8465	919.8125 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	973.7630	770.1381	676.9246	433.4246	240.4407	0.0000	0.0000	0.0000	0.0000	408.4754	705.4616	995.4681 (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	244.6904	216.3525	230.0117	202.9342	197.1238	178.0909	176.2353	183.0615	184.8506	205.5349	217.7760	242.1388 (64)
Efficiency of water heater (217)m	86.9099	86.7343	86.4118	85.8093	84.6384	80.3000	80.3000	80.3000	80.3000	85.6653	86.5780	80.3000 (216)
Fuel for water heating, kWh/month	281.5449	249.4430	266.1810	236.4944	232.9012	221.7819	219.4711	227.9719	230.2000	239.9278	251.5374	278.4509 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	26.5223	21.2772	19.1577	14.0358	10.8416	8.8577	9.8901	12.8555	16.6981	21.9088	24.7459	27.2594 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-44.9118	-62.8393	-89.6490	-100.0067	-107.1535	-99.7351	-98.4498	-93.2368	-83.9906	-71.4235	-49.1836	-38.8808 (233a)

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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	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	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	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-26.8631	-56.3305	-111.6463	-167.2518	-220.7581	-221.7053	-219.1453	-185.7743	-136.4320	-80.4736	-35.8345	-21.2608		(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	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	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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													5204.0960	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													80.3000	
Water heating fuel used													2935.9054	(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)													214.0500	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-2422.9363	(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													6017.1151	(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	5204.0960	0.2100	1092.8602 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2935.9054	0.2100	616.5401 (264)
Space and water heating			1709.4003 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	214.0500	0.1443	30.8940 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-939.4605	0.1348	-126.5998
PV Unit electricity exported	-1483.4759	0.1260	-186.8699
Total			-313.4697 (269)
Total CO2, kg/year			1438.7539 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.6800 (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	5204.0960	1.1300	5880.6284 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2935.9054	1.1300	3317.5731 (278)
Space and water heating			9198.2016 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	214.0500	1.5338	328.3170 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-939.4605	1.4981	-1407.3611
PV Unit electricity exported	-1483.4759	0.4624	-685.9452
Total			-2093.3062 (283)
Total Primary energy kWh/year			7563.3132 (286)
Target Primary Energy Rate (TPER)			77.1500 (287)

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Property Reference	London Road 3		Issued on Date	26/09/2023	
Assessment Reference	02 Be Green	Prop Type Ref			
Property	Flat 3, 39-41, London Road, Enfield, EN2 6LX				
SAP Rating	85 B	DER	3.02	TER	14.36
Environmental	97 A	% DER < TER			78.97
CO ₂ Emissions (t/year)	0.24	DFEE	54.23	TFEE	55.45
Compliance Check	See BREL	% DFEE < TFEE			2.19
% DPER < TPER	51.29	DPER	36.75	TPER	75.45
Assessor Details	Mr. Thomas McMahon			Assessor ID	R863-0001
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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	8.5400 (1b)	x 2.8700 (2b)	= 24.5098 (1b)
First floor	89.5000 (1c)	x 2.8100 (2c)	= 251.4950 (1c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	98.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 276.0048 (5)

2. Ventilation rate

	m ³ 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)										
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		4.0000 (17)										
Infiltration rate		0.2000 (18)										
Number of sides sheltered		3 (19)										
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)										
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1550 (21)										
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												84.6000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2746	0.2707	0.2669	0.2475	0.2436	0.2242	0.2242	0.2204	0.2320	0.2436	0.2514	0.2591 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Glazing (Uw = 1.20)			28.3500	1.1450	32.4618		(27)
Door			2.3300	1.2000	2.7960		(26)

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Ground Floor			8.5400	0.1200	1.0248	110.0000	939.4000 (28a)
Exposed Floor			4.3700	0.1600	0.6992	20.0000	87.4000 (28b)
External Walls	135.4200	30.6800	104.7400	0.1800	18.8532	60.0000	6284.4000 (29a)
Flat Roof	89.5000		89.5000	0.1300	11.6350	9.0000	805.5000 (30)
Total net area of external elements Aum(A, m2)			237.8300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	67.4700		(33)
Party Walls			24.4200	0.0000	0.0000	70.0000	1709.4000 (32)
Party Floor 1			76.5900			30.0000	2297.7000 (32d)
Internal Walls			164.5000			9.0000	1480.5000 (32c)
Internal Floor 1			8.5400			18.0000	153.7200 (32d)
Internal Ceiling 1			8.5400			9.0000	76.8600 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13834.8800 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 141.1146 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	15.1200	0.2440	3.6893
E3 Sill	3.1600	0.0210	0.0664
E4 Jamb	41.9400	0.0160	0.6710
E5 Ground floor (normal)	4.8200	0.0430	0.2073
E15 Flat roof with parapet	48.3100	0.3000	14.4930
E16 Corner (normal)	14.5000	0.0350	0.5075
E7 Party floor between dwellings (in blocks of flats)	26.4300	0.1400	3.7002
P1 Party wall - Ground floor	8.5100	0.0360	0.3064
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.5100	0.0000	0.0000
E18 Party wall between dwellings	2.8700	0.0550	0.1579
E6 Intermediate floor within a dwelling	2.8500	0.0010	0.0029
E20 Exposed floor (normal)	2.2200	0.0380	0.0844
E17 Corner (inverted - internal area greater than external area)	5.5000	-0.0710	-0.3905
E21 Exposed floor (inverted)	1.9700	0.3200	0.6304
E24 Eaves (insulation at ceiling level - inverted)	16.8100	0.1500	2.5215

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 26.6475 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 94.1175 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	119.1308	118.7778	118.4249	116.6602	116.3072	114.5425	114.5425	114.1896	115.2484	116.3072	117.0131	117.7190 (39)
Average = Sum(39)m / 12 =												116.5719

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2151	1.2115	1.2079	1.1899	1.1863	1.1683	1.1683	1.1647	1.1755	1.1863	1.1935	1.2007 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	69.8357	68.7862	67.2569	64.3308	62.1715	59.7634	58.3946	59.9123	61.5761	64.1616	67.1506	69.5682 (42a)
Hot water usage for baths	30.1549	29.7070	29.0764	27.9136	27.0429	26.0774	25.5559	26.1821	26.8640	27.8971	29.0838	30.0529 (42b)
Hot water usage for other uses	42.4919	40.9468	39.4016	37.8564	36.3113	34.7661	34.7661	36.3113	37.8564	39.4016	40.9468	42.4919 (42c)
Average daily hot water use (litres/day)												130.9735 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	142.4825	139.4400	135.7349	130.1008	125.5256	120.6069	118.7166	122.4057	126.2965	131.4603	137.1812	142.1130 (44)
Energy content (annual)	225.6575	198.5607	208.6195	178.1015	168.9816	148.3002	143.5774	151.5639	155.7362	178.3904	195.4397	222.5146 (45)
Distribution loss (46)m = 0.15 x (45)m	33.8486	29.7841	31.2929	26.7152	25.3472	22.2450	21.5366	22.7346	23.3604	26.7586	29.3160	33.3772 (46)

Water storage loss:

Store volume 150.0000 (47)

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

Temperature factor from Table 2b 1.2500 (48)

Enter (49) or (54) in (55) 0.5400 (49)

Total storage loss 0.6750 (55)

20.9250 18.9000 20.9250 20.2500 20.9250 20.2500 20.9250 20.9250 20.2500 20.9250 20.2500 20.9250 20.9250 (56)

If cylinder contains dedicated solar storage 20.9250 18.9000 20.9250 20.2500 20.9250 20.2500 20.9250 20.9250 20.2500 20.9250 20.2500 20.9250 20.9250 (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 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 0.0000 (61)

Total heat required for water heating calculated for each month 269.8449 238.4719 252.8069 220.8635 213.1690 191.0622 187.7648 195.7513 198.4982 222.5778 238.2017 266.7020 (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 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 -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 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 0.0000 (63d)

Output from w/h 269.8449 238.4719 252.8069 220.8635 213.1690 191.0622 187.7648 195.7513 198.4982 222.5778 238.2017 266.7020 (64)

Total per year (kWh/year) = Sum(64)m = 2695.7143 (64)

2696 (64)

12Total per year (kWh/year)

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 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 110.3810 97.9504 104.7159 93.4284 91.5363 83.5194 83.0894 85.7449 85.9919 94.6647 99.1933 109.3360 (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	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	127.6698	141.3487	127.6698	131.9255	127.6698	131.9255	127.6698	127.6698	131.9255	127.6698	131.9255	127.6698 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	253.1196	255.7462	249.1273	235.0364	217.2492	200.5317	189.3634	186.7368	193.3557	207.4466	225.2338	241.9513 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031 (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)	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250 (71)
Water heating gains (Table 5)	148.3616	145.7595	140.7472	129.7616	123.0327	115.9992	111.6793	115.2485	119.4332	127.2375	137.7685	146.9570 (72)
Total internal gains	592.9604	606.6639	581.3537	560.5329	531.7610	512.2657	492.5219	493.4645	508.5237	526.1633	558.7372	580.3876 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W						
North	11.5900	10.6334	0.4000	0.7000	0.7700	23.9137 (74)						
South	11.6300	46.7521	0.4000	0.7000	0.7700	105.5047 (78)						
West	5.1300	19.6403	0.4000	0.7000	0.7700	19.5504 (80)						
Solar gains	148.9688	256.7345	360.7428	465.3576	539.8331	544.5935	521.4048	464.1972	396.5440	286.1505	178.9367	127.1787 (83)
Total gains	741.9292	863.3984	942.0964	1025.8905	1071.5942	1056.8592	1013.9267	957.6617	905.0677	812.3139	737.6739	707.5663 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, n1,m (see Table 9a)												21.0000 (85)
tau	32.2589	32.3547	32.4511	32.9420	33.0420	33.5510	33.5510	33.6547	33.3456	33.0420	32.8427	32.6457
alpha	3.1506	3.1570	3.1634	3.1961	3.2028	3.2367	3.2367	3.2436	3.2230	3.2028	3.1895	3.1764
util living area	0.9715	0.9537	0.9264	0.8665	0.7656	0.6111	0.4696	0.5102	0.7117	0.8871	0.9545	0.9751 (86)
Living	19.3439	19.5637	19.8635	20.2573	20.5805	20.7964	20.8704	20.8595	20.7170	20.2985	19.7638	19.3151
Non living	17.9815	18.2600	18.6372	19.1300	19.5083	19.7455	19.8069	19.8031	19.6689	19.1918	18.5265	17.9533
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.1528	19.5637	19.8635	20.2573	20.5805	20.7964	20.8704	20.8595	20.7170	20.2985	19.7638	19.5508 (87)
Th 2	19.9079	19.9108	19.9137	19.9281	19.9310	19.9454	19.9454	19.9483	19.9396	19.9310	19.9252	19.9194 (88)
util rest of house	0.9660	0.9450	0.9121	0.8398	0.7175	0.5331	0.3677	0.4077	0.6408	0.8587	0.9444	0.9703 (89)
MIT 2	19.1399	18.2600	18.6372	19.1300	19.5083	19.7455	19.8069	19.8031	19.6689	19.1918	18.5265	18.3076 (90)
Living area fraction									fLA = Living area / (4) =			0.2869 (91)
MIT	19.4305	18.6341	18.9890	19.4535	19.8160	20.0470	20.1120	20.1062	19.9696	19.5093	18.8815	18.6643 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4305	18.6341	18.9890	19.4535	19.8160	20.0470	20.1120	20.1062	19.9696	19.5093	18.8815	18.6643 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9632	0.9320	0.8971	0.8260	0.7117	0.5412	0.3845	0.4239	0.6430	0.8453	0.9318	0.9631 (94)
Useful gains	714.6098	804.7002	845.1631	847.3604	762.6611	571.9251	389.8536	405.9645	581.9760	686.6636	687.3366	681.4835 (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	1802.5127	1631.3047	1479.0104	1231.1674	943.9442	623.9168	402.2778	423.2095	676.4659	1036.2198	1378.5891	1702.7208 (97)
Space heating kWh	809.3998	555.4782	471.5824	276.3411	134.8746	0.0000	0.0000	0.0000	0.0000	260.0698	497.7018	759.8006 (98a)
Space heating requirement - total per year (kWh/year)												3765.2483
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	809.3998	555.4782	471.5824	276.3411	134.8746	0.0000	0.0000	0.0000	0.0000	260.0698	497.7018	759.8006 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3765.2483
Space heating per m2										(98c) / (4) =		38.4052 (99)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													268.9127 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	809.3998	555.4782	471.5824	276.3411	134.8746	0.0000	0.0000	0.0000	0.0000	260.0698	497.7018	759.8006	(98)
Space heating efficiency (main heating system 1)	268.9127	268.9127	268.9127	268.9127	268.9127	0.0000	0.0000	0.0000	0.0000	268.9127	268.9127	268.9127	(210)
Space heating fuel (main heating system)	300.9898	206.5645	175.3664	102.7624	50.1555	0.0000	0.0000	0.0000	0.0000	96.7116	185.0793	282.5455	(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 requirement	269.8449	238.4719	252.8069	220.8635	213.1690	191.0622	187.7648	195.7513	198.4982	222.5778	238.2017	266.7020	(64)
Efficiency of water heater (217)m	186.6152	186.6152	186.6152	186.6152	186.6152	186.6152	186.6152	186.6152	186.6152	186.6152	186.6152	186.6152	(216)
Fuel for water heating, kWh/month	144.5996	127.7881	135.4696	118.3524	114.2292	102.3830	100.6160	104.8957	106.3677	119.2710	127.6433	142.9155	(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	22.8217	20.6132	22.8217	22.0855	22.8217	22.0855	22.8217	22.8217	22.0855	22.8217	22.0855	22.8217	(231)
Lighting	29.5067	23.6714	21.3135	15.6151	12.0616	9.8544	11.0030	14.3021	18.5770	24.3740	27.5304	30.3268	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-34.8816	-52.5121	-80.4413	-94.8075	-104.5808	-95.3350	-94.1095	-86.8964	-74.2337	-61.0311	-39.1275	-29.6571	(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	-9.1945	-21.0383	-44.8234	-73.0719	-102.8201	-108.5731	-107.1038	-88.9047	-63.4539	-32.9933	-13.1531	-7.2270	(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													1400.1751 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													186.6152
Water heating fuel used													1444.5310 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7980) mechanical ventilation fans (SFP = 0.7980)													268.7072 (230a)
Total electricity for the above, kWh/year													268.7072 (231)
Electricity for lighting (calculated in Appendix L)													238.1361 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1519.9707 (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													1831.5787 (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	1400.1751	0.1553	217.4129 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1444.5310	0.1410	203.7151 (264)
Space and water heating			421.1280 (265)
Pumps, fans and electric keep-hot	268.7072	0.1387	37.2730 (267)
Energy for lighting	238.1361	0.1443	34.3704 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-847.6135	0.1339	-113.4751
PV Unit electricity exported	-672.3571	0.1233	-82.8973
Total			-196.3725 (269)
Total CO2, kg/year			296.3989 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0200 (273)

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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	1400.1751	1.5748	2205.0360	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1444.5310	1.5215	2197.8044	(278)
Space and water heating			4402.8404	(279)
Pumps, fans and electric keep-hot	268.7072	1.5128	406.5003	(281)
Energy for lighting	238.1361	1.5338	365.2611	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-847.6135	1.4948	-1266.9738	
PV Unit electricity exported	-672.3571	0.4524	-304.1876	
Total			-1571.1615	(283)
Total Primary energy kWh/year			3603.4403	(286)
Dwelling Primary energy Rate (DPER)			36.7500	(287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	8.5400 (1b)	x 2.8700 (2b)	= 24.5098 (1b) -
First floor	89.5000 (1c)	x 2.8100 (2c)	= 251.4950 (1c) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	98.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 276.0048 (5)

2. Ventilation rate

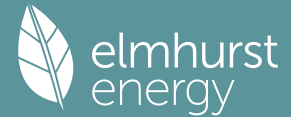
		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1087 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3587	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2780 (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
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
Adj infilt rate	0.3544	0.3475	0.3405	0.3058	0.2988	0.2641	0.2641	0.2571	0.2780	0.2988	0.3127	0.3266
Effective ac	0.5628	0.5604	0.5580	0.5468	0.5447	0.5349	0.5349	0.5331	0.5386	0.5447	0.5489	0.5533

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.3300	1.0000	2.3300		(26)
TER Opening Type (Uw = 1.20)			22.1800	1.1450	25.3969		(27)
Ground Floor			8.5400	0.1300	1.1102		(28a)
Exposed Floor			4.3700	0.1300	0.5681		(28b)
External Walls	135.4200	24.5100	110.9100	0.1800	19.9638		(29a)
Flat Roof	89.5000		89.5000	0.1100	9.8450		(30)

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Total net area of external elements Aum(A, m2)	237.8300			(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	59.2140		(33)
Party Walls	24.4200	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 141.1146 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	15.1200	0.0500	0.7560
E3 Sill	3.1600	0.0500	0.1580
E4 Jamb	41.9400	0.0500	2.0970
E5 Ground floor (normal)	4.8200	0.1600	0.7712
E15 Flat roof with parapet	48.3100	0.5600	27.0536
E16 Corner (normal)	14.5000	0.0900	1.3050
E7 Party floor between dwellings (in blocks of flats)	26.4300	0.0700	1.8501
P1 Party wall - Ground floor	8.5100	0.0800	0.6808
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.5100	0.0000	0.0000
E18 Party wall between dwellings	2.8700	0.0600	0.1722
E6 Intermediate floor within a dwelling	2.8500	0.0000	0.0000
E20 Exposed floor (normal)	2.2200	0.3200	0.7104
E17 Corner (inverted - internal area greater than external area)	5.5000	-0.0900	-0.4950
E21 Exposed floor (inverted)	1.9700	0.3200	0.6304
E24 Eaves (insulation at ceiling level - inverted)	16.8100	0.2400	4.0344
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			39.7241 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss			(33) + (36) + (36a) = 98.9381 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	51.2618	51.0396	50.8219	49.7991	49.6077	48.7169	48.7169	48.5520	49.0601	49.6077	49.9949	50.3996 (38)
Average = Sum(39)m / 12 =	150.1999	149.9778	149.7600	148.7372	148.5459	147.6551	147.6551	147.4901	147.9982	148.5459	148.9330	149.3377 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.5320	1.5298	1.5275	1.5171	1.5152	1.5061	1.5061	1.5044	1.5096	1.5152	1.5191	1.5232 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7206 (42)
Hot water usage for mixer showers												69.5682 (42a)
Hot water usage for baths												30.0529 (42b)
Hot water usage for other uses												42.4919 (42c)
Average daily hot water use (litres/day)												130.9735 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	142.4825	139.4400	135.7349	130.1008	125.5256	120.6069	118.7166	122.4057	126.2965	131.4603	137.1812	142.1130 (44)
Energy content (annual)	225.6575	198.5607	208.6195	178.1015	168.9816	148.3002	143.5774	151.5639	155.7362	178.3904	195.4397	222.5146 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2175.4433
Water storage loss:	33.8486	29.7841	31.2929	26.7152	25.3472	22.2450	21.5366	22.7346	23.3604	26.7586	29.3160	33.3772 (46)
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	272.2524	240.6465	255.2144	223.1934	215.5765	193.3920	190.1723	198.1588	200.8281	224.9853	240.5316	269.1095 (62)
WWHRS	-31.9260	-28.2356	-29.5667	-24.4824	-22.8167	-19.5244	-18.3010	-19.4613	-20.2007	-23.8144	-26.9788	-31.3348 (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	240.3264	212.4109	225.6477	198.7110	192.7598	173.8676	171.8713	178.6975	180.6273	201.1709	213.5527	237.7748 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 2427.4179 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	112.3070	99.6900	106.6419	95.2922	93.4623	85.3833	85.0154	87.6709	87.8558	96.5907	101.0572	111.2620 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313	136.0313 (66)

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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	127.6458	141.3222	127.6458	131.9007	127.6458	131.9007	127.6458	131.9007	127.6458	131.9007	127.6458	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	253.1196	255.7462	249.1273	235.0364	217.2492	200.5317	189.3634	186.7368	193.3557	207.4466	225.2338	241.9513 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	36.6031	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	-108.8250	(71)
Water heating gains (Table 5)	150.9503	148.3482	143.3359	132.3503	125.6214	118.5879	114.2680	117.8372	122.0219	129.8263	140.3572	149.5458 (72)
Total internal gains	598.5252	612.2260	586.9184	566.0968	537.3258	514.8297	495.0866	496.0292	511.0877	531.7281	564.3011	585.9523 (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
North	9.0700	10.6334	0.6300	0.7000	0.7700	29.4748 (74)
South	9.1000	46.7521	0.6300	0.7000	0.7700	130.0212 (78)
West	4.0100	19.6403	0.6300	0.7000	0.7700	24.0693 (80)

Solar gains	183.5653	316.3537	444.5058	573.4030	665.1667	671.0320	642.4597	571.9714	488.6163	352.5979	220.4920	156.7153 (83)
Total gains	782.0904	928.5797	1031.4242	1139.4999	1202.4925	1185.8617	1137.5463	1068.0007	999.7040	884.3260	784.7931	742.6676 (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	25.5860	25.6239	25.6612	25.8377	25.8709	26.0270	26.0270	26.0561	25.9667	25.8709	25.8037	25.7338
alpha	2.7057	2.7083	2.7107	2.7225	2.7247	2.7351	2.7351	2.7371	2.7311	2.7247	2.7202	2.7156
util living area	0.9702	0.9524	0.9255	0.8707	0.7800	0.6447	0.5107	0.5533	0.7397	0.8931	0.9544	0.9739 (86)
MIT	18.3624	18.6917	19.1633	19.7780	20.3286	20.7262	20.8958	20.8671	20.5729	19.8568	19.0017	18.3021 (87)
Th 2	19.6636	19.6653	19.6669	19.6747	19.6762	19.6830	19.6830	19.6842	19.6803	19.6762	19.6732	19.6701 (88)
util rest of house	0.9640	0.9425	0.9095	0.8412	0.7261	0.5517	0.3799	0.4235	0.6588	0.8623	0.9432	0.9684 (89)
MIT 2	16.6579	17.0730	17.6648	18.4241	19.0706	19.4955	19.6381	19.6217	19.3550	18.5384	17.4756	16.5854 (90)
Living area fraction	fLA = Living area / (4) =											0.2869 (91)
MIT	17.1470	17.5374	18.0947	18.8125	19.4315	19.8486	19.9989	19.9791	19.7044	18.9167	17.9135	17.0780 (92)
Temperature adjustment												0.0000
adjusted MIT	17.1470	17.5374	18.0947	18.8125	19.4315	19.8486	19.9989	19.9791	19.7044	18.9167	17.9135	17.0780 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9465	0.9205	0.8843	0.8174	0.7145	0.5646	0.4136	0.4551	0.6606	0.8395	0.9221	0.9523 (94)
Useful gains	740.2223	854.7539	912.1232	931.4110	859.1848	669.5807	470.4795	486.0763	660.3598	742.4147	723.6455	707.2229 (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	1929.6164	1895.3360	1736.4297	1474.3642	1148.4872	774.9832	501.8687	527.8760	829.4481	1235.4096	1610.4832	1923.1646 (97)
Space heating kWh	884.9092	699.2712	613.2840	390.9263	215.2410	0.0000	0.0000	0.0000	0.0000	366.7882	638.5231	904.6606 (98a)
Space heating requirement - total per year (kWh/year)												4713.6036
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	884.9092	699.2712	613.2840	390.9263	215.2410	0.0000	0.0000	0.0000	0.0000	366.7882	638.5231	904.6606 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4713.6036
Space heating per m2												(98c) / (4) = 48.0784 (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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	884.9092	699.2712	613.2840	390.9263	215.2410	0.0000	0.0000	0.0000	0.0000	366.7882	638.5231	904.6606 (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)												

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Space heating efficiency (main heating system 2)	958.7315	757.6069	664.4464	423.5388	233.1971	0.0000	0.0000	0.0000	0.0000	397.3870	691.7910	980.1307	(211)
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	(212)
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 requirement	240.3264	212.4109	225.6477	198.7110	192.7598	173.8676	171.8713	178.6975	180.6273	201.1709	213.5527	237.7748	(64)
Efficiency of water heater (217)m	86.7113	86.5264	86.1856	85.5485	84.3078	79.8000	79.8000	79.8000	79.8000	85.3889	86.3590	79.8000	(216)
Fuel for water heating, kWh/month (233a)m	277.1569	245.4869	261.8161	232.2789	228.6382	217.8792	215.3776	223.9317	226.3500	235.5936	247.2850	274.0497	(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	26.5223	21.2772	19.1577	14.0358	10.8416	8.8577	9.8901	12.8555	16.6981	21.9088	24.7459	27.2594	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-44.9118	-62.8393	-89.6490	-100.0067	-107.1535	-99.7351	-98.4498	-93.2368	-83.9906	-71.4235	-49.1836	-38.8808	(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	-26.8631	-56.3305	-111.6463	-167.2518	-220.7581	-221.7053	-219.1453	-185.7743	-136.4320	-80.4736	-35.8345	-21.2608	(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												5106.8295	(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												2885.8438	(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)												214.0500	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2422.9363	(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												5869.7870	(238)

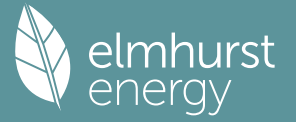
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5106.8295	0.2100	1072.4342 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2885.8438	0.2100	606.0272 (264)
Space and water heating			1678.4614 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	214.0500	0.1443	30.8940 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-939.4605	0.1348	-126.5998
PV Unit electricity exported	-1483.4759	0.1260	-186.8699
Total			-313.4697 (269)
Total CO2, kg/year			1407.8150 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.3600 (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	5106.8295	1.1300	5770.7174 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2885.8438	1.1300	3261.0035 (278)
Space and water heating			9031.7209 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	214.0500	1.5338	328.3170 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-939.4605	1.4981	-1407.3611
PV Unit electricity exported	-1483.4759	0.4624	-685.9452

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Total
Total Primary energy kWh/year
Target Primary Energy Rate (TPER)

-2093.3062 (283)
7396.8325 (286)
75.4500 (287)