



Sustainability Statement

155 Tottenham Lane

Listen. Consider. Apply. Deliver.

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1.0 Introduction

1.1 Executive Summary

MES have been commissioned by UK Properties One Ltd to provide a sustainability statement in order to address the requirements of Condition 5 of planning application reference HGY/2021/2630 in relation to the proposed development at 155 Tottenham Lane, Hornsey. The purpose of this sustainability statement is to provide an overview of how sustainability will be promoted, to establish the predicted energy requirements for the proposed development and show how the design addresses overheating, sustainable materials use and the site impact on biodiversity. It will also show how domestic potable water use will be minimised.

The proposed development has been granted planning consent under application reference HGY/2021/2630. Condition 5 is a pre-commencement condition that states;

5. Prior to any demolition, a Sustainability Statement shall be submitted and approved in writing by the Local Planning Authority. This should include a statement that demonstrates how the proposals have included greening on the site, and how the construction is making use of recycled and re-used materials, sustainable labour to address London's urban heat island effect and other methods to encourage biodiversity.

In line with the favoured approach of Haringey Council and the GLA we have calculated the total energy requirement for the development using Part L 2021 SAP calculations. This is in line with the guidance contained in paragraph 9.2.6 of the London Plan 2021. For the proposed development this has been achieved by the use of;

- Improved building fabric over the Part L 2021 'Notional Building' specification for conversion units

Table 1.1, below, shows the modelled performance based on the SAP calculations for each stage of the Energy Hierarchy. Further details can be found in Section 3 and the appendices to this report.

Table 1.1: Total reduction in energy use and carbon emissions				
	Regulated Energy Consumption (kWh per annum)	Regulated CO ₂ Emissions (Tonnes per annum)	Regulated CO ₂ savings	
			(Tonnes per annum)	(%)
Baseline	35,440.35	7.3		
As Designed	31,758.80	6.5	0.8	11%
Cumulative on site savings	3,681.55		0.8	11%

The development has been assessed for the risk of overheating using the Good Homes Alliance overheating tool, as Part O does not cover conversions in existing buildings. Full details can be found in Section 4 of this report and in Appendix 3, but the assessment shows the proposed development to be at a low to moderate risk of overheating.

The overall environmental performance of the new elements of the development have been assessed in Section 5 of this report. This shows that all the new elements of the development achieve at least a B rating from the BRE's Green Guide to Specification, with the vast majority of the new or replacement elements (all aside from the . In addition the development retains a significant amount of the existing building, which significantly reduces the embodied carbon of the development.

Both pre- and post-development UGF calculations can be found in Appendix 4 to this report. These show that the pre-development UGF for the site is 0, whilst the post-development UGF is 0.04. This demonstrates that the development as proposed does provide an improvement in urban greening and biodiversity over that of the existing development site.

The expected potable water consumption of the development has been assessed in Section 7 of this report. This identifies that the proposed development is able to achieve the Optional Requirement of the Building Regulations – a mains water consumption of 110 litres per person per day. For the full specification and calculation associated with this please see Section 7 and Appendix 5 to this report.

1.2 Planning Policy

The proposed development has been granted planning consent under application reference HGY/2021/2630. Condition 5 is a pre-commencement condition that states;

5. Prior to any demolition, a Sustainability Statement shall be submitted and approved in writing by the Local Planning Authority. This should include a statement that demonstrates how the proposals have included greening on the site, and how the construction is making use of recycled and re-used materials, sustainable labour to address London's urban heat island effect and other methods to encourage biodiversity.

Reason: To ensure sustainable development in accordance with London Plan 2021 and Local Plan Policy SP4.

This report will address the above condition.

2.0 Description of the Development

2.1 Location

The proposed development is located on Tottenham Lane, Hornsey. The surrounding area is comprised of a mix of residential and commercial buildings ranging from 2 to 5 storeys in height. The site location can be found in Figure 2.1, below.



Figure 2.1: Aerial photograph showing site location

2.2 Details of the Development

The application is for the conversion of an existing two-storey commercial/office area to the rear of the main frontage onto Tottenham Lane into four flats and a courtyard garden/access area

The existing building is comprised of an original volume fronting onto Tottenham Lane that appears to be of 1800s construction, but does not form part of the conversion area of the development. The rear parts of the building that form the actual envelope of the proposed development appear to be of later construction, but still comprise a solid external wall construction with a timber flat roof.

The proposals are for the partial demolition of the rear areas to form an open access courtyard and the conversion of the remaining space into four flats – two on the ground floor and two on the first floor.

Floor plans and elevations showing the proposed development can be found in Figures 2.2-2.4, below.

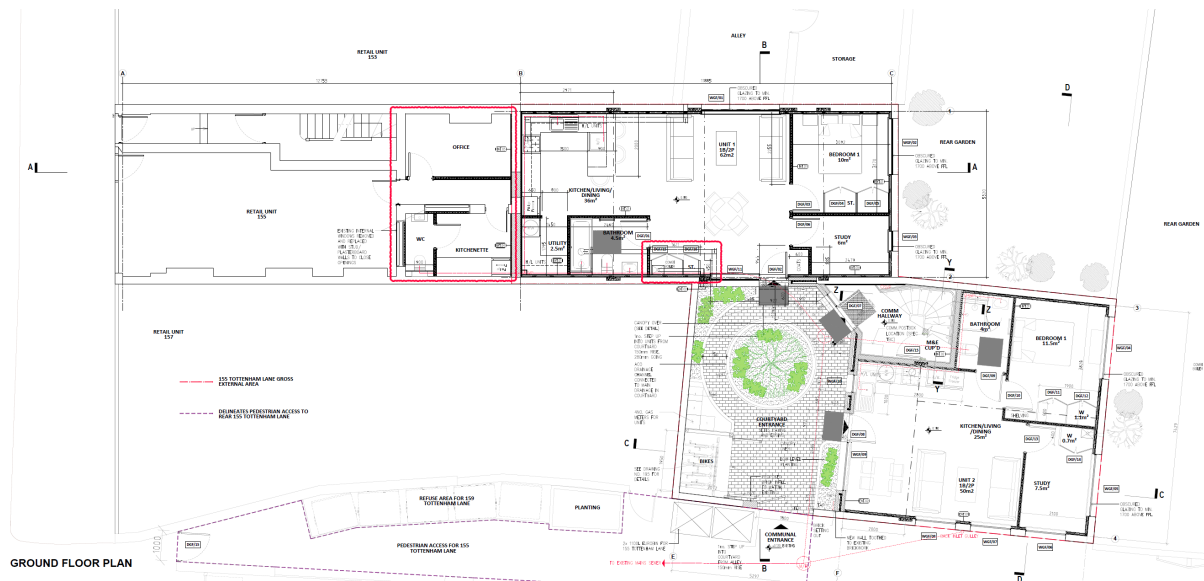


Figure 2.2 – Ground floor plan

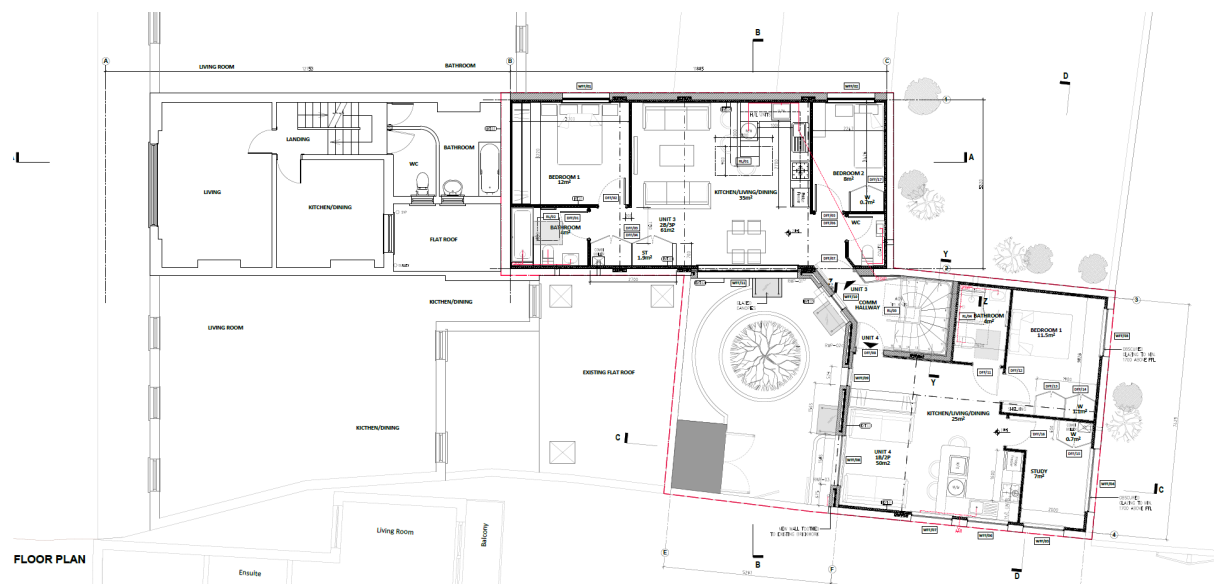


Figure 2.3 – First floor plan

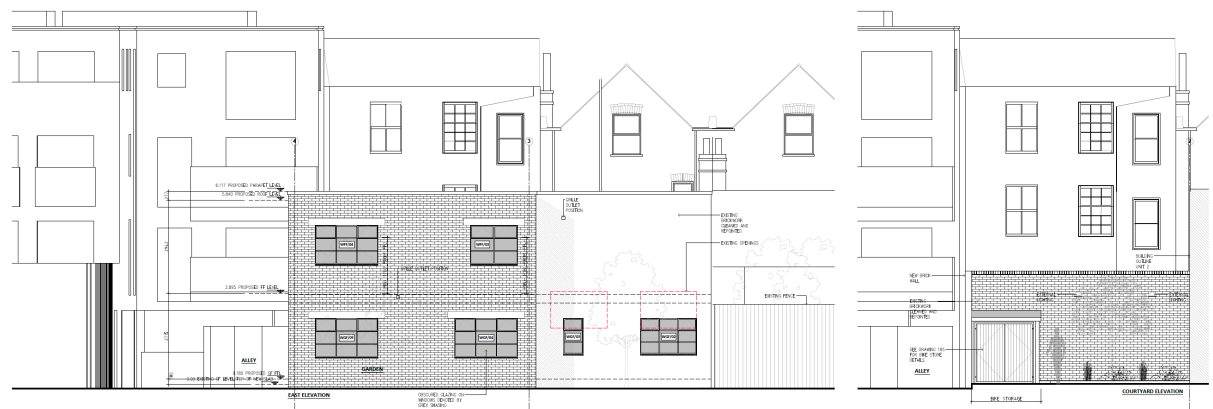
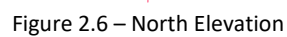
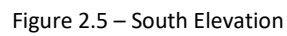


Figure 2.4 – East Elevation



3.0 Energy Statement

3.1 The Energy Hierarchy

In order to address energy efficiency the design team have adopted the energy hierarchy. The energy hierarchy is generally accepted as the most effective way of reducing a buildings' carbon emissions.

1. Be lean: use less energy
2. Be clean: supply energy efficiently
3. Be green: use renewable energy
4. Be seen: monitor, verify and report on energy performance

Development proposals should:

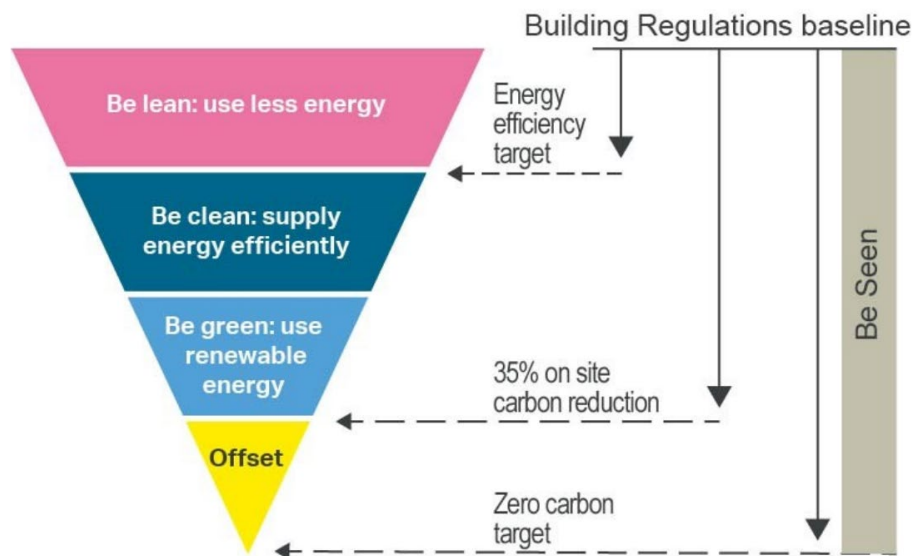


Figure 3.1: The Energy Hierarchy

- **Reducing energy demand**

The first step in the process of reducing the overall energy used and CO₂ produced by the building is to minimise the energy required to heat it. A well-insulated building envelope and passive design will reduce the energy requirement for heating and ventilating the building.

- **Energy efficient systems**

The second step is to specify services and controls, lighting and appliances that are energy efficient and which result in further reduction in energy requirements.

- **Making use of Low or zero-carbon (LZC) technologies**

When the energy demand has been reduced by implementing the processes of improving the fabric and energy efficiency, then LZC technologies can be employed to reduce the environmental impact of the remaining energy consumption.

- **Monitoring and reporting**

Ensure comprehensive monitoring and reporting of energy demand and carbon emissions. Major developments are required to undertake this process for at least five years.

3.2 Calculating Baseline Energy Demand

The first step is to calculate a specification in order to establish baseline emissions for the development. For this development energy modelling has been undertaken following the 2021 Part L methodology - SAP10.2 has been

used to model the four residential units. As the proposed development is for a conversion of an existing building the baseline performance has been taken as the minimum Part L requirement that applies to conversion units. Therefore the baseline is not the SAP TER (as this is for New-Build units only) but a separate 'Notional' calculation has been produced for each unit. This contains the minimum Part L requirements for all the fabric and M&E elements of the units.

The combined results of this Notional/Baseline modelling for the whole development are shown in Table 3.1 below and full details (in the form of the SAP worksheets) can be found in Appendix 1 to this report.

Table 3.1: 'Baseline' energy use and carbon emissions				
	Regulated Energy Consumption (kWh per annum)	Regulated CO ₂ Emissions (Tonnes per annum)	Regulated CO ₂ savings	
			(Tonnes per annum)	(%)
Baseline	35,440.35	7.3		
Cumulative on site savings	3,681.55		0.8	11%

The strategic aim is to reduce carbon emissions overall, so that while planning decisions and monitoring requirements will be underpinned by the targets expressed above, the requirement for energy assessments to include separate details of unregulated emissions is to recognise explicitly the additional contribution that can be made through use of efficient equipment, building controls and good management practices, including green leases. Unregulated emissions are, therefore, considered (particularly as part of the EUI calculation) but are not taken into account when calculating percentage improvements or any carbon offset payment.

The unregulated energy consumption for the proposed development has been calculated, for the residential units, by using SAP10.2 Appendix L equations L13 and L20. This approach give us a total of 4,946kWh/year for the residential units. Applying the Part L 2021 mains electricity carbon factor (0.136kg/kWh gives a total of 0.67tonnes/year. This accounts for all unregulated energy used for cooking, all appliances and any small power in the development.

3.3 Energy & CO₂ Emissions Reductions

The development has already received planning consent based on a set of approved drawings. These, therefore, limit the changes that can be made at this stage to influence the energy performance of the building. As such this section details the performance based on the approved building design and specification.

The full specification used for modelling the as-designed building can be found in Table 3.2, below.

Table 3.2: 'As-Designed' Specification	
Element	Specification
External Walls (refurbished)	0.30W/m ² K
External Walls (new)	0.30W/m ² K
Ground Floors	0.17W/m ² K
Roofs	0.14W/m ² K
Windows	1.60W/m ² K
Front Doors	1.40W/m ² K
Air Permeability	8.00m ³ /m ² /hr @ 50pa
Thermal Bridging	n/a
Ventilation	dMEV
Lighting	LED lamps throughout (80 lumens/watt)
Space Heating	Mains Gas Combi Boiler
DHW	From main heating system
LZC Technology	none

The improved 'As Designed' carbon dioxide emissions and energy consumption figures as taken from the SAP10.2 models for the above specification are shown in Table 3.3, below, and the SAP worksheets can be found in Appendix 2.

Table 3.3: Total reduction in energy use and carbon emissions				
	Regulated Energy Consumption (kWh per annum)	Regulated CO ₂ Emissions (Tonnes per annum)	Regulated CO ₂ savings	
			(Tonnes per annum)	(%)
Baseline	35,440.35	7.3		
As Designed	31,758.80	6.5	0.8	11%
Cumulative on site savings	3,681.55		0.8	11%

4.0 Overheating & Urban Heat Island

Overheating is recognised as a growing issue within the housing stock of the UK. Since June 2022 Part O of the Building Regulations has required new-build residential schemes to assess and mitigate overheating risk. However, this part of the Building Regulations does not apply to existing buildings – such as the proposed development. As such the expected risk associated with the proposed development has been assessed using the Good Homes Alliance Overheating Risk Tool. This provides a quick way of assessing overheating risk in a proposed development whilst flagging further detailed work if the risk is found to be too great. The completed tool can be found in Appendix 3 to this report, but a summary of the key factors likely to increase the likelihood of overheating can be found below;

- The site is located in Greater London
- The site does not have any specific characteristics that would require windows to be closed or non-openable during the evening other than reasonable precautions regarding ground floor windows/doors and security risks. However, it is unlikely that units 1 & 2 would be able to leave windows open all day as they are ground floor flats.
- The dwellings are flats.
- No community heating is proposed for the development.
- The amount of glazing on the 'solar exposed' facades of the development does not exceed 35% (it does not exceed 25% as measured).
- The proposed development provides dual-aspect dwellings.

Similarly, the counterbalancing factors that reduce the likelihood of overheating can be found in the completed tool, but a summary of those proposed for the development can be found below.

- The immediate surroundings of the development site are gardens and the rural countryside, so mainly green in colour.
- The site is bounded on the Western side by a much taller building, which will provide shading. The articulation of the development will also provide shading to the courtyard windows. There are also some large trees to the south of the site that will provide some shading to these windows as well.
- Windows will be designed to provide large opening areas to help dissipate heat – the opening areas of these will provide a more than 100% increase in the purge rate openable areas as required by Part F (2010).

The result of this is that the GHA tool estimates a low to medium likelihood of overheating.

5.0 Materials

Building materials have a significant impact when the embodied energy and resources used in their manufacture, transport and disposal are considered. Responsible sourcing of materials can have a real beneficial effect on the embodied impact of the final development.

For this development the external walls and structural ground & first floor elements are being retained on site and re-used. This will result in a significant reduction in virgin materials being required for the development. Compared to an equivalent new-build, therefore, this development will have a significantly lower embodied carbon footprint.

However, as there are some new/replacement elements proposed as part of the development all relevant materials in new/replacement basic and finishing elements will be responsibly and legally sourced from certified suppliers using sustainable raw materials where possible. 100% of timber and timber based products will be 'Legal' and 'Sustainable' as per the UK Government's Timber Procurement Policy. Wherever possible, reused and recycled materials will be sourced where these provide a viable alternative to virgin material.

All materials will be sourced from local suppliers where possible to reduce transport miles and support the local supply chain.

Materials containing chemicals which are harmful to health or the environment will be avoided wherever possible.

The performance of the proposed specifications for the new/replacement elements forming the development can be found in Table 5.1, below. These have been taken from the BRE's Green Guide to Specification¹.

Element	Proposed Specification	Green Guide Reference	Green Guide Rating
New Flat Roofs	T Timber joists, OSB/3 decking, vapour control layer, insulation, PVC single ply waterproofing membrane	1212540038	A+
New External Walls	Brickwork outer leaf, insulation, medium dense solid blockwork inner leaf, cement mortar, plasterboard on battens, paint	806170047	A+
New Internal Walls	Timber stud, plasterboard, paint	809760003	A+
New Walls to Stairwells	Medium dense solid blockwork, plasterboard, paint	809180008	B
New Windows	PVC-U window with steel reinforcement, double glazed	813100009	A

¹ <https://tools.bregroup.com/greenguide/podpage.jsp?id=2126>

6.0 Urban Greening

The UGF is a tool used to evaluate the quality and quantity of natural features proposed as part of a development application, such as planting, waterbodies and green roofs, collectively referred to as urban greening. It enables major developments to demonstrate how they have included urban greening as a fundamental element of site and building design in order to meet London Plan Policy G5 Urban greening.

UGF target scores should be set out in Local Plans. Where Local Plans do not have UGF scores, the London Plan UGF scores of 0.4 for predominately residential developments and 0.3 for predominately commercial developments¹ should be applied.

It should be noted that this development is neither 'Major', being of fewer than 10 units, nor new, being a conversion of an existing building. As such achieving the above target is going to be impractical, as the existing structure of the building would be unlikely to support green roofs or walls. Consequently we will look at the UGF for the existing building and then for the development as proposed – as this approach will enable any improvement to be identified and quantified.

Both pre- and post-development UGF calculations can be found in Appendix 4 to this report. These show that the pre-development UGF for the site is 0, whilst the post-development UGF is 0.04. This demonstrates that the development as proposed does provide an improvement in urban greening and biodiversity over that of the existing development site.

7.0 Water Consumption

Water is a precious commodity even in the UK and with ever increasing demand for clean drinking water measures need to be taken to safeguard future supplies.

Approximately 50% of the water consumed in domestic dwellings is not used for consumption, (the percentage is even higher in many commercial buildings) it is for washing and flushing of toilets etc. Measures to reduce the amount of potable water used for these activities reduce the demand for potable water and make better use of this limited resource.

In line with the requirement of London Plan 2021 policy SI5 water use in the residential units will be reduced to at least 110l/person/day (which includes 5l/person/day for external water use). This reduction in water use will be achieved through specification of water use fittings that do not exceed the following specification;

Taps (other than kitchen taps)		6.00(litres/min)
Kitchen Taps		10.00(litres/min)
Showers		8.00(litres/min)
Baths (with shower over)		170(litres to overflow)
WCs (Flush Volume)	Full Flush:	4.00(litres)
	Part Flush:	2.60(litres)
Washing Machine		8.17(litres/kg dry load)
Dishwasher		1.25(litres/place setting)

For full details of the consumption of this specification please see Appendix 5 to this report.



Appendix 1

‘Notional/Baseline’ SAP Worksheets

Full SAP Calculation Printout



Property Reference	Unit 1				Issued on Date	07/08/2023
Assessment Reference	Baseline	Prop Type Ref				
Property	Unit 1, 15, Tottenham Lane, London, N8 9BT					
SAP Rating	73 C	DER	29.13	TER	10.68	
Environmental	78 C	% DER < TER				-172.75
CO ₂ Emissions (t/year)	1.6	DFEE	66.06	TFEE	25.04	
Compliance Check	See BREL	% DFEE < TFEE				-163.85
% DPER < TPER	-195.22	DPER	164.68	TPER	55.78	
Assessor Details	Mr. Tom Reynolds				Assessor ID	8440-0005
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	63.0400 (1b)	x 2.4000 (2b)	= 151.2960 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0400		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 151.2960 (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)

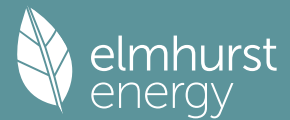
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test	0.0000 / (5) = 0.0000 (8)
Pressure Test Method	No
Measured/design AP50	Blower Door
Infiltration rate	15.0000 (17)
Number of sides sheltered	0.7500 (18)
	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7500 (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	0.9562	0.9375	0.9188	0.8250	0.8062	0.7125	0.7125	0.6938	0.7500	0.8062	0.8438	0.8813 (22b)
Mechanical extract ventilation - decentralised												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)												
Effective ac	1.2062	1.1875	1.1688	1.0750	1.0562	0.9625	0.9625	0.9438	1.0000	1.0562	1.0938	1.1313 (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
Windows (Uw = 1.40)			7.5000	1.3258	9.9432		(27)
Door			1.6600	1.4000	2.3240		(26)
Heatloss Floor 1			63.4000	0.2500	15.8500	110.0000	6974.0000 (28a)
External Wall 1	23.0700	9.1600	13.9100	0.3000	4.1730	150.0000	2086.5000 (29a)

Full SAP Calculation Printout



External Wall 2	3.4000	3.4000	0.1800	0.6120	150.0000	510.0000 (29a)
Total net area of external elements Aum(A, m2)	89.8700	89.8700				(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =		32.9022			(33)
Party Wall 1	12.9600	0.0000	0.0000	180.0000	2332.8000	(32)
Party Ceiling 1	63.4000			20.0000	1268.0000	(32b)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13171.3000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.9356	(35)
Thermal bridges (Default value 0.200 * total exposed area)		17.9740	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	50.8762	(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	60.2253	59.2891	58.3530	53.6723	52.7361	48.0554	48.0554	47.1192	49.9277	52.7361	54.6084	56.4807 (38)
Average = Sum(39)m / 12 =	111.1014	110.1653	109.2292	104.5484	103.6123	98.9316	98.9316	97.9954	100.8039	103.6123	105.4846	107.3569 (39)
												104.3144
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.7624	1.7475	1.7327	1.6584	1.6436	1.5693	1.5693	1.5545	1.5990	1.6436	1.6733	1.7030 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

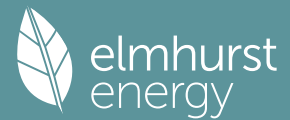
Assumed occupancy												2.0662 (42)
Hot water usage for mixer showers	80.9355	79.7192	77.9468	74.5557	72.0531	69.2622	67.6759	69.4349	71.3630	74.3596	77.8236	80.6254 (42a)
Hot water usage for baths	26.7746	26.3770	25.8170	24.7846	24.0115	23.1542	22.6912	23.2472	23.8526	24.7699	25.8237	26.6841 (42b)
Hot water usage for other uses	37.6731	36.3032	34.9333	33.5633	32.1934	30.8235	30.8235	32.1934	33.5633	34.9333	36.3032	37.6731 (42c)
Average daily hot water use (litres/day)												133.6924 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	145.3833	142.3994	138.6971	132.9036	128.2579	123.2399	121.1905	124.8755	128.7790	134.0628	139.9504	144.9827 (44)
Energy content (annual)	230.2516	202.7749	213.1723	181.9383	172.6599	151.5379	146.5695	154.6220	158.7974	181.9219	199.3851	227.0078 (45)
Distribution loss (46)m = 0.15 x (45)m												2220.6385
Distribution loss (46)m	34.5377	30.4162	31.9758	27.2908	25.8990	22.7307	21.9854	23.1933	23.8196	27.2883	29.9078	34.0512 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	281.2105	248.8023	264.1312	231.2534	223.6188	200.8529	197.5284	205.5809	208.1125	232.8808	248.7001	277.9667 (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	281.2105	248.8023	264.1312	231.2534	223.6188	200.8529	197.5284	205.5809	208.1125	232.8808	248.7001	277.9667 (64)
12Total per year (kWh/year)												2820.6385 (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)
												0.0000 (64a)
Heat gains from water heating, kWh/month	89.2984	78.9295	83.6195	72.8233	70.1491	62.7151	61.4741	64.1515	65.1289	73.2288	78.6243	88.2198 (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
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	101.2699	112.1202	101.2699	104.6455	101.2699	104.6455	101.2699	101.2699	104.6455	101.2699	104.6455	101.2699 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	180.5436	182.4171	177.6960	167.6453	154.9582	143.0340	135.0680	133.1945	137.9156	147.9663	160.6534	172.5776 (68)
Pumps, fans	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308 (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)	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461 (71)
Total internal gains	120.0247	117.4546	112.3918	101.1434	94.2865	87.1043	82.6264	86.2252	90.4568	98.4258	109.2004	118.5750 (72)
	458.8305	468.9842	448.3500	430.4266	407.5068	388.7762	372.9566	374.6818	387.0102	404.6542	431.4917	449.4148 (73)

6. Solar gains

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[Jan]			Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast			1.6400	11.2829	0.6300	0.7000	0.7700	5.6551 (75)
Southeast			2.0700	36.7938	0.6300	0.7000	0.7700	23.2765 (77)
Southwest			3.7900	36.7938	0.6300	0.7000	0.7700	42.6173 (79)

Solar gains	71.5489	123.7526	174.3130	224.3451	258.9185	260.4037	249.6597	223.3531	191.5590	138.1182	86.0411	61.0096 (83)
Total gains	530.3794	592.7368	622.6630	654.7717	666.4253	649.1799	622.6162	598.0349	578.5692	542.7724	517.5328	510.4243 (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	32.9311	33.2110	33.4956	34.9952	35.3114	36.9821	36.9821	37.3354	36.2952	35.3114	34.6846	34.0797	
alpha	3.1954	3.2141	3.2330	3.3330	3.3541	3.4655	3.4655	3.4890	3.4197	3.3541	3.3123	3.2720	
util living area	0.9869	0.9802	0.9698	0.9430	0.8880	0.7663	0.6229	0.6575	0.8391	0.9476	0.9792	0.9884 (86)	
MIT	18.6928	18.9283	19.2931	19.8562	20.3414	20.7562	20.9147	20.8962	20.6247	20.0024	19.3101	18.7247 (87)	
Th 2	19.4964	19.5069	19.5175	19.5708	19.5815	19.6359	19.6359	19.6469	19.6140	19.5815	19.5600	19.5387 (88)	
util rest of house	0.9829	0.9741	0.9598	0.9223	0.8416	0.6646	0.4616	0.5028	0.7580	0.9245	0.9718	0.9850 (89)	
MIT 2	17.4749	17.7148	18.0819	18.6670	19.1285	19.5159	19.6127	19.6153	19.4045	18.8220	18.1309	17.5350 (90)	
Living area fraction									fLA = Living area / (4) =				0.5441 (91)
MIT	18.1376	18.3751	18.7409	19.3140	19.7885	20.1907	20.3211	20.3123	20.0684	19.4642	18.7725	18.1823 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	17.9876	18.2251	18.5909	19.1640	19.6385	20.0407	20.1711	20.1623	19.9184	19.3142	18.6225	18.0323 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9772	0.9670	0.9515	0.9149	0.8439	0.6986	0.5300	0.5671	0.7790	0.9188	0.9652	0.9799 (94)
Useful gains	518.3064	573.1478	592.4644	599.0269	562.3635	453.5054	329.9895	339.1697	450.7003	498.6912	499.5076	500.1429 (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	1520.7079	1467.9614	1320.6768	1073.0896	822.5219	538.2616	353.2934	368.6864	586.5217	902.9022	1215.4486	1484.9954 (97)
Space heating kWh	745.7867	601.3147	541.7900	341.3252	193.5578	0.0000	0.0000	0.0000	0.0000	300.7330	515.4775	732.7302 (98a)
Space heating requirement - total per year (kWh/year)												3972.7151
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	745.7867	601.3147	541.7900	341.3252	193.5578	0.0000	0.0000	0.0000	0.0000	300.7330	515.4775	732.7302 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3972.7151
Space heating per m2										(98c) / (4) =		63.0190 (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 %)												84.0000 (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	745.7867	601.3147	541.7900	341.3252	193.5578	0.0000	0.0000	0.0000	0.0000	300.7330	515.4775	732.7302 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	887.8414	715.8509	644.9881	406.3395	230.4260	0.0000	0.0000	0.0000	0.0000	358.0155	613.6636	872.2979 (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	281.2105	248.8023	264.1312	231.2534	223.6188	200.8529	197.5284	205.5809	208.1125	232.8808	248.7001	277.9667 (64)
Efficiency of water heater												75.0000 (216)
(217)m	81.3277	81.1500	80.8214	80.1171	78.9234	75.0000	75.0000	75.0000	75.0000	79.8198	80.8428	81.3163 (217)
Fuel for water heating, kWh/month	345.7745	306.5955	326.8085	288.6444	283.3365	267.8039	263.3712	274.1078	277.4833	291.7583	307.6343	341.8339 (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	38.6576	34.9166	38.6576	37.4106	38.6576	37.4106	38.6576	38.6576	37.4106	38.6576	37.4106	38.6576 (231)

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Lighting	24.9154	19.9880	17.9970	13.1854	10.1848	8.3210	9.2909	12.0766	15.6864	20.5814	23.2466	25.6078 (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												4729.4228 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												3575.1520 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEV)Decentralised, Table 4g: in-use factor = 2.5000, SFP = 2.0000)												
mechanical ventilation fans (SFP = 2.0000)												369.1622 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												455.1622 (231)
Electricity for lighting (calculated in Appendix L)												201.0813 (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												8960.8184 (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	4729.4228	0.2100	993.1788 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3575.1520	0.2100	750.7819 (264)
Space and water heating			1743.9607 (265)
Pumps, fans and electric keep-hot	455.1622	0.1387	63.1366 (267)
Energy for lighting	201.0813	0.1443	29.0222 (268)
Total CO2, kg/year			1836.1196 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			29.1300 (273)

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

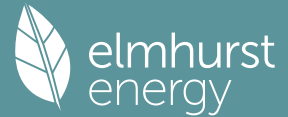
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	4729.4228	1.1300	5344.2478 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3575.1520	1.1300	4039.9218 (278)
Space and water heating			9384.1696 (279)
Pumps, fans and electric keep-hot	455.1622	1.5128	688.5694 (281)
Energy for lighting	201.0813	1.5338	308.4252 (282)
Total Primary energy kWh/year			10381.1642 (286)
Dwelling Primary energy Rate (DPER)			164.6800 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	63.0400 (1b)	x 2.4000 (2b)	= 151.2960 (1b) -

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Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 63.0400 (4)
 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 151.2960 (5)

2. Ventilation rate

m3 per hour

Number of open chimneys 0 * 80 = 0.0000 (6a)
 Number of open flues 0 * 20 = 0.0000 (6b)
 Number of chimneys / flues attached to closed fire 0 * 10 = 0.0000 (6c)
 Number of flues attached to solid fuel boiler 0 * 20 = 0.0000 (6d)
 Number of flues attached to other heater 0 * 35 = 0.0000 (6e)
 Number of blocked chimneys 0 * 20 = 0.0000 (6f)
 Number of intermittent extract fans 2 * 10 = 20.0000 (7a)
 Number of passive vents 0 * 10 = 0.0000 (7b)
 Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1322 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 5.0000 (17)
 Infiltration rate 0.3822 (18)
 Number of sides sheltered 0 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 1.0000 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3822 (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	0.4873	0.4777	0.4682	0.4204	0.4109	0.3631	0.3631	0.3535	0.3822	0.4109	0.4300	0.4491	(22b)
Effective ac	0.6187	0.6141	0.6096	0.5884	0.5844	0.5659	0.5659	0.5625	0.5730	0.5844	0.5924	0.6008	(25)

3. Heat losses and heat loss parameter

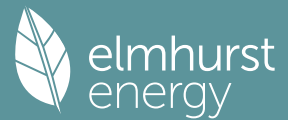
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.6600	1.0000	1.6600			(26)
TER Opening Type (Uw = 1.20)			7.5000	1.1450	8.5878			(27)
Heatloss Floor 1			63.4000	0.1300	8.2420			(28a)
External Wall 1	23.0700	9.1600	13.9100	0.1800	2.5038			(29a)
External Wall 2	3.4000		3.4000	0.1800	0.6120			(29a)
Total net area of external elements Aum(A, m2)			89.8700					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	21.6056		(33)
Party Wall 1			12.9600	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								218.9927 (35)
Thermal bridges (User defined value 0.050 * total exposed area)								4.4935 (36)
Point Thermal bridges								(36a) = 0.0000
Total fabric heat loss						(33) + (36) + (36a) =		26.0991 (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	30.8916	30.6615	30.4358	29.3761	29.1778	28.2548	28.2548	28.0839	28.6103	29.1778	29.5789	29.9982	(38)
Average = Sum(39)m / 12 =	56.9907	56.7605	56.5349	55.4752	55.2769	54.3539	54.3539	54.1829	54.7094	55.2769	55.6780	56.0973	(39)
												55.4742	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9040	0.9004	0.8968	0.8800	0.8769	0.8622	0.8622	0.8595	0.8679	0.8769	0.8832	0.8899	(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													2.0662 (42)
Hot water usage for mixer showers													
	58.8622	57.9776	56.6886	54.2223	52.4022	50.3725	49.2188	50.4981	51.9004	54.0797	56.5990	58.6367	(42a)
Hot water usage for baths													
	25.4359	25.0581	24.5262	23.5453	22.8109	21.9965	21.5566	22.0849	22.6600	23.5314	24.5325	25.3499	(42b)
Hot water usage for other uses													
	35.7895	34.4880	33.1866	31.8852	30.5837	29.2823	29.2823	30.5837	31.8852	33.1866	34.4880	35.7895	(42c)
Average daily hot water use (litres/day)													110.3880 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	120.0876	117.5238	114.4014	109.6528	105.7969	101.6513	100.0578	103.1667	106.4456	110.7977	115.6195	119.7761	(44)
Energy content (annual)	190.1894	167.3523	175.8307	150.1092	142.4229	124.9922	121.0112	127.7419	131.2580	150.3515	164.7212	187.5404	(45)
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 1833.5208

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	28.5284	25.1028	26.3746	22.5164	21.3634	18.7488	18.1517	19.1613	19.6887	22.5527	24.7082	28.1311 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	241.1483	213.3797	226.7896	199.4243	193.3818	174.3072	171.9701	178.7008	180.5731	201.3104	214.0362	238.4993 (62)
WWHRS	-26.9093	-23.7988	-24.9208	-20.6354	-19.2314	-16.4565	-15.4253	-16.4033	-17.0265	-20.0724	-22.7396	-26.4110 (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	214.2389	189.5809	201.8688	178.7889	174.1504	157.8508	156.5448	162.2975	163.5466	181.2380	191.2967	212.0883 (64)
												2183.4905 (64)
12Total per year (kWh/year)												2183 (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)
												0.0000 (64a)
Heat gains from water heating, kWh/month	75.9777	67.1515	71.2034	62.2401	60.0953	53.8887	52.9759	55.2139	55.9721	62.7316	67.0986	75.0969 (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	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.2699	112.1202	101.2699	104.6455	101.2699	104.6455	101.2699	101.2699	104.6455	101.2699	104.6455	101.2699	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.5436	182.4171	177.6960	167.6453	154.9582	143.0340	135.0680	133.1945	137.9156	147.9663	160.6534	172.5776	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	(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)	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	(71)
Water heating gains (Table 5)	102.1206	99.9278	95.7035	86.4446	80.7733	74.8454	71.2042	74.2122	77.7390	84.3167	93.1924	100.9367	(72)
Total internal gains	440.9264	451.4574	431.6617	415.7277	393.9937	376.5172	361.5343	362.6689	374.2924	390.5451	415.4837	431.7764	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W

Northeast			1.6400		11.2829		0.6300		0.7000		0.7700		5.6551 (75)
Southeast			2.0700		36.7938		0.6300		0.7000		0.7700		23.2765 (77)
Southwest			3.7900		36.7938		0.6300		0.7000		0.7700		42.6173 (79)

Solar gains	71.5489	123.7526	174.3130	224.3451	258.9185	260.4037	249.6597	223.3531	191.5590	138.1182	86.0411		61.0096 (83)
Total gains	512.4752	575.2100	605.9747	640.0728	652.9121	636.9209	611.1940	586.0220	565.8514	528.6633	501.5248		492.7860 (84)

7. Mean internal temperature (heating season)

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

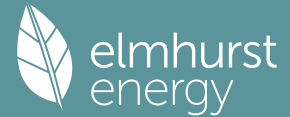
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	67.2882	67.5611	67.8308	69.1265	69.3745	70.5526	70.5526	70.7751	70.0941	69.3745	68.8747	68.3599
alpha	5.4859	5.5041	5.5221	5.6084	5.6250	5.7035	5.7035	5.7183	5.6729	5.6250	5.5916	5.5573
util living area	0.9843	0.9695	0.9429	0.8681	0.7325	0.5382	0.3902	0.4235	0.6432	0.8822	0.9670	0.9868 (86)
MIT	20.1125	20.2929	20.5065	20.7695	20.9285	20.9898	20.9986	20.9978	20.9729	20.7836	20.4242	20.0923 (87)
Th 2	20.1641	20.1672	20.1702	20.1845	20.1872	20.1997	20.1997	20.2021	20.1949	20.1872	20.1818	20.1761 (88)
util rest of house	0.9803	0.9621	0.9291	0.8391	0.6831	0.4741	0.3198	0.3510	0.5769	0.8501	0.9577	0.9835 (89)
MIT 2	19.1414	19.3694	19.6353	19.9570	20.1279	20.1936	20.1992	20.2012	20.1769	19.9810	19.5476	19.1252 (90)
Living area fraction									fLA = Living area / (4) =			0.5441 (91)
MIT	19.6698	19.8718	20.1093	20.3991	20.5635	20.6268	20.6342	20.6346	20.6100	20.4177	20.0245	19.6514 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6698	19.8718	20.1093	20.3991	20.5635	20.6268	20.6342	20.6346	20.6100	20.4177	20.0245	19.6514 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9774	0.9591	0.9280	0.8472	0.7066	0.5086	0.3581	0.3904	0.6117	0.8599	0.9556	0.9808 (94)

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Useful gains	500.8825	551.6580	562.3473	542.2953	461.3637	323.9525	218.8661	228.7892	346.1543	454.6213	479.2816	483.3343 (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	875.9351	849.8098	769.4002	637.9126	489.9466	327.5813	219.2728	229.4454	356.1581	542.6900	719.6126	866.7839 (97)
Space heating kWh	279.0391	200.3580	154.0474	68.8444	21.2656	0.0000	0.0000	0.0000	0.0000	65.5231	173.0383	285.2865 (98a)
Space heating requirement - total per year (kWh/year)												1247.4024
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	279.0391	200.3580	154.0474	68.8444	21.2656	0.0000	0.0000	0.0000	0.0000	65.5231	173.0383	285.2865 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1247.4024
Space heating per m2										(98c) / (4) =		19.7875 (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	279.0391	200.3580	154.0474	68.8444	21.2656	0.0000	0.0000	0.0000	0.0000	65.5231	173.0383	285.2865 (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)	301.9904	216.8377	166.7179	74.5070	23.0148	0.0000	0.0000	0.0000	0.0000	70.9125	187.2709	308.7516 (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	214.2389	189.5809	201.8688	178.7889	174.1504	157.8508	156.5448	162.2975	163.5466	181.2380	191.2967	212.0883 (64)	
Efficiency of water heater	84.9486	84.5001	83.8091	82.5193	81.1543	80.3000	80.3000	80.3000	80.3000	82.4171	84.1671	80.3000 (216)	
Fuel for water heating, kWh/month	252.1982	224.3557	240.8674	216.6632	214.5916	196.5763	194.9499	202.1140	203.6695	219.9035	227.2821	249.4645 (219)	
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)	
Lighting	21.0419	16.8806	15.1991	11.1355	8.6014	7.0274	7.8465	10.1991	13.2477	17.3817	19.6325	21.6267 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-29.8041	-42.1716	-60.8385	-68.6727	-74.2973	-69.4665	-68.6500	-64.7215	-57.7749	-48.3973	-32.8378	-25.7528 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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)	-16.3474	-34.4549	-68.5949	-103.1753	-136.5508	-137.2206	-135.5646	-114.6834	-83.9574	-49.2729	-21.8291	-12.9185 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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												1350.0027 (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												2642.6359 (219)	
Space cooling fuel												0.0000 (221)	

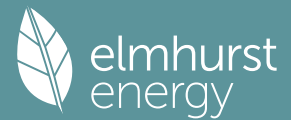
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	169.8200 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1557.9550 (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	2690.5036 (238)

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

	Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	1350.0027	0.2100	283.5006 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2642.6359	0.2100	554.9535 (264)
Space and water heating			838.4541 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	169.8200	0.1443	24.5103 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-643.3852	0.1345	-86.5330
PV Unit electricity exported	-914.5697	0.1259	-115.1074
Total			-201.6404 (269)
Total CO2, kg/year			673.2532 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6800 (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	1350.0027	1.1300	1525.5030 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2642.6359	1.1300	2986.1786 (278)
Space and water heating			4511.6816 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	169.8200	1.5338	260.4756 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-643.3852	1.4971	-963.1933
PV Unit electricity exported	-914.5697	0.4620	-422.5223
Total			-1385.7156 (283)
Total Primary energy kWh/year			3516.5423 (286)
Target Primary Energy Rate (TPER)			55.7800 (287)

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Property Reference	Unit 2	Issued on Date	07/08/2023
Assessment Reference	Baseline	Prop Type Ref	
Property	155, Tittenham Lane , London, N8 9BT		
SAP Rating	71 C	DER	37.18
Environmental	75 C	TER	13.34
CO ₂ Emissions (t/year)	1.51	% DER < TER	-178.71
Compliance Check	See BREL	DFEE	87.41
% DPER < TPER	-197.40	TFEE	35.74
		% DFEE < TFEE	-144.57
		TPER	70.05
Assessor Details	Mr. Tom Reynolds	Assessor ID	8440-0005
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	46.6600 (1b)	x 2.4000 (2b)	= 111.9840 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.6600		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 111.9840 (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) =	Air changes per hour
Pressure test	0.0000 / (5) = 0.0000 (8)
Pressure Test Method	No
Measured/design AP50	Blower Door
Infiltration rate	15.0000 (17)
Number of sides sheltered	0.7500 (18)
	0 (19)

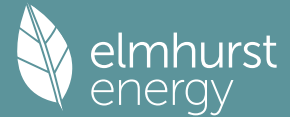
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7500 (21)

	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	0.9562	0.9375	0.9188	0.8250	0.8062	0.7125	0.7125	0.6938	0.7500	0.8062	0.8438	0.8813 (22b)
Mechanical extract ventilation - decentralised												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)												
Effective ac	1.2062	1.1875	1.1688	1.0750	1.0562	0.9625	0.9625	0.9438	1.0000	1.0562	1.0938	1.1313 (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
Windows (Uw = 1.40)			12.2400	1.3258	16.2273		(27)
Door			1.8900	1.4000	2.6460		(26)
Heatloss Floor 1			46.6600	0.2500	11.6650	110.0000	5132.6000 (28a)
External Wall	46.3200	14.1300	32.1900	0.3000	9.6570	150.0000	4828.5000 (29a)

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External Wall 2	11.0400	11.0400	0.1800	1.9872	150.0000	1656.0000 (29a)
Total net area of external elements Aum(A, m2)		104.0200				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		42.1825		(33)
Party Wall 1		13.4400	0.0000	0.0000	70.0000	940.8000 (32)
Party Ceiling 1		46.6600			20.0000	933.2000 (32b)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13491.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		289.1363 (35)
Thermal bridges (Default value 0.200 * total exposed area)		20.8040 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	62.9865 (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	44.5766	43.8837	43.1908	39.7263	39.0334	35.5689	35.5689	34.8760	36.9547	39.0334	40.4192	41.8050 (38)
Average = Sum(39)m / 12 =	107.5631	106.8702	106.1773	102.7128	102.0199	98.5554	98.5554	97.8625	99.9412	102.0199	103.4057	104.7915 (39)
												102.5396
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	2.3053	2.2904	2.2756	2.2013	2.1865	2.1122	2.1122	2.0974	2.1419	2.1865	2.2162	2.2459 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

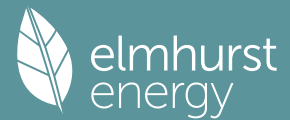
Assumed occupancy												1.5924 (42)
Hot water usage for mixer showers												
	89.8414	88.4913	86.5239	82.7596	79.9816	76.8836	75.1228	77.0753	79.2156	82.5419	86.3871	89.4972 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	30.9380	29.8129	28.6879	27.5629	26.4379	25.3129	25.3129	26.4379	27.5629	28.6879	29.8129	30.9380 (42c)
Average daily hot water use (litres/day)												110.9562 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	120.7794	118.3042	115.2118	110.3225	106.4195	102.1965	100.4356	103.5132	106.7785	111.2298	116.2000	120.4352 (44)
Energy conte	191.2850	168.4636	177.0762	151.0259	143.2611	125.6625	121.4682	128.1709	131.6686	150.9378	165.5482	188.5724 (45)
Energy content (annual)										Total = Sum(45)m =		1843.1406
Distribution loss (46)m = 0.15 x (45)m	28.6928	25.2695	26.5614	22.6539	21.4892	18.8494	18.2202	19.2256	19.7503	22.6407	24.8322	28.2859 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	242.2439	214.4910	228.0351	200.3410	194.2200	174.9776	172.4271	179.1298	180.9837	201.8967	214.8633	239.5313 (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	242.2439	214.4910	228.0351	200.3410	194.2200	174.9776	172.4271	179.1298	180.9837	201.8967	214.8633	239.5313 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2443.1406 (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)
												0.0000 (64a)
Heat gains from water heating, kWh/month	76.3420	67.5210	71.6176	62.5449	60.3740	54.1116	53.1279	55.3566	56.1086	62.9265	67.3735	75.4400 (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
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	69.8921	77.3805	69.8921	72.2218	69.8921	72.2218	69.8921	69.8921	72.2218	69.8921	72.2218	69.8921 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	138.5689	140.0068	136.3833	128.6693	118.9318	109.7799	103.6659	102.2280	105.8515	113.5654	123.3030	132.4549 (68)
Pumps, fans	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621 (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)	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967 (71)
Total internal gains	102.6102	100.4777	96.2602	86.8679	81.1479	75.1549	71.4085	74.4040	77.9286	84.5787	93.5744	101.3979 (72)
	360.9575	367.7513	352.4218	337.6453	319.8581	304.0430	291.8527	293.4103	302.8881	317.9225	338.9854	353.6311 (73)

6. Solar gains

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[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	5.0000	36.7938	0.6300	0.7000	0.7700	56.2234 (77)
Southwest	6.3000	36.7938	0.6300	0.7000	0.7700	70.8414 (79)
Northwest	0.9400	11.2829	0.6300	0.7000	0.7700	3.2413 (81)

Solar gains	130.3061	223.0362	308.0276	386.4545	437.2364	435.9990	419.5487	381.3689	335.1421	247.2736	156.2728	111.3880 (83)
Total gains	491.2636	590.7875	660.4494	724.0998	757.0944	740.0419	711.4014	674.7792	638.0303	565.1961	495.2582	465.0191 (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	34.8403	35.0662	35.2950	36.4855	36.7333	38.0246	38.0246	38.2938	37.4973	36.7333	36.2410	35.7618
alpha	3.3227	3.3377	3.3530	3.4324	3.4489	3.5350	3.5350	3.5529	3.4998	3.4489	3.4161	3.3841
util living area	0.9902	0.9813	0.9657	0.9281	0.8536	0.7135	0.5633	0.6045	0.8070	0.9433	0.9826	0.9918 (86)
MIT	18.7445	19.0315	19.4408	20.0030	20.4705	20.8183	20.9418	20.9251	20.6923	20.0761	19.3428	18.7444 (87)
Th 2	19.1376	19.1468	19.1560	19.2025	19.2119	19.2596	19.2596	19.2692	19.2404	19.2119	19.1931	19.1745 (88)
util rest of house	0.9861	0.9736	0.9508	0.8945	0.7799	0.5713	0.3616	0.4051	0.6872	0.9094	0.9740	0.9885 (89)
MIT 2	17.2236	17.5121	17.9183	18.4855	18.9041	19.1951	19.2509	19.2561	19.1078	18.5737	17.8542	17.2482 (90)
Living area fraction									fLA = Living area / (4) =			0.5394 (91)
MIT	18.0440	18.3317	18.7396	19.3041	19.7490	20.0707	20.1630	20.1564	19.9625	19.3841	18.6572	18.0553 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0440	18.3317	18.7396	19.3041	19.7490	20.0707	20.1630	20.1564	19.9625	19.3841	18.6572	18.0553 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9827	0.9689	0.9464	0.8969	0.8056	0.6439	0.4721	0.5142	0.7435	0.9135	0.9705	0.9855 (94)
Useful gains	482.7553	572.4402	625.0163	649.4138	609.9234	476.4833	335.8745	346.9728	474.3912	516.3328	480.6525	458.2675 (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	1478.3454	1435.4481	1299.5692	1068.6309	821.1608	539.1712	351.1554	367.6115	585.9078	896.1571	1195.0802	1451.9203 (97)
Space heating kWh	740.7191	579.9413	501.8673	301.8363	157.1606	0.0000	0.0000	0.0000	0.0000	282.5892	514.3880	739.2777 (98a)
Space heating requirement - total per year (kWh/year)												3817.7795
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	740.7191	579.9413	501.8673	301.8363	157.1606	0.0000	0.0000	0.0000	0.0000	282.5892	514.3880	739.2777 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3817.7795
Space heating per m2										(98c) / (4) =		81.8212 (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 %)												79.0000 (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	740.7191	579.9413	501.8673	301.8363	157.1606	0.0000	0.0000	0.0000	0.0000	282.5892	514.3880	739.2777 (98)
Space heating efficiency (main heating system 1)	79.0000	79.0000	79.0000	79.0000	79.0000	0.0000	0.0000	0.0000	0.0000	79.0000	79.0000	79.0000 (210)
Space heating fuel (main heating system)	937.6191	734.1029	635.2751	382.0713	198.9374	0.0000	0.0000	0.0000	0.0000	357.7079	651.1240	935.7946 (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	242.2439	214.4910	228.0351	200.3410	194.2200	174.9776	172.4271	179.1298	180.9837	201.8967	214.8633	239.5313 (64)
Efficiency of water heater												75.0000 (216)
(217)m	81.5872	81.3639	80.9646	80.1624	78.7750	75.0000	75.0000	75.0000	75.0000	79.9995	81.1315	81.6036 (217)
Fuel for water heating, kWh/month	296.9141	263.6195	281.6479	249.9191	246.5503	233.3035	229.9028	238.8398	241.3116	252.3725	264.8334	293.5302 (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	30.5109	27.5582	30.5109	29.5267	30.5109	29.5267	30.5109	30.5109	29.5267	30.5109	29.5267	30.5109 (231)

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Lighting	17.8856	14.3485	12.9192	9.4652	7.3112	5.9733	6.6695	8.6693	11.2605	14.7744	16.6877	18.3827 (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												4832.6323 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												3092.7445 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEV)Decentralised, Table 4g: in-use factor = 2.5000, SFP = 2.0000)												
mechanical ventilation fans (SFP = 2.0000)												273.2410 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												359.2410 (231)
Electricity for lighting (calculated in Appendix L)												144.3470 (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												8428.9648 (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	4832.6323	0.2100	1014.8528 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3092.7445	0.2100	649.4764 (264)
Space and water heating			1664.3291 (265)
Pumps, fans and electric keep-hot	359.2410	0.1387	49.8312 (267)
Energy for lighting	144.3470	0.1443	20.8337 (268)
Total CO2, kg/year			1734.9940 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			37.1800 (273)

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

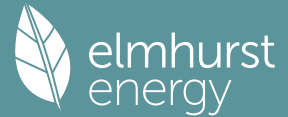
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	4832.6323	1.1300	5460.8745 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3092.7445	1.1300	3494.8013 (278)
Space and water heating			8955.6758 (279)
Pumps, fans and electric keep-hot	359.2410	1.5128	543.4597 (281)
Energy for lighting	144.3470	1.5338	221.4043 (282)
Total Primary energy kWh/year			9720.5398 (286)
Dwelling Primary energy Rate (DPER)			208.3300 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	46.6600 (1b)	x 2.4000 (2b)	= 111.9840 (1b) -

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Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 46.6600 (4)
 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 111.9840 (5)

2. Ventilation rate

	m3 per hour											
Number of open chimneys	0 * 80 =	0.0000	(6a)									
Number of open flues	0 * 20 =	0.0000	(6b)									
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)									
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)									
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)									
Number of blocked chimneys	0 * 20 =	0.0000	(6f)									
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)									
Number of passive vents	0 * 10 =	0.0000	(7b)									
Number of flueless gas fires	0 * 40 =	0.0000	(7c)									
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1786	(8)									
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	5.0000	(17)										
Infiltration rate	0.4286	(18)										
Number of sides sheltered	0	(19)										
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)									
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4286	(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	0.5465	0.5357	0.5250	0.4715	0.4607	0.4072	0.4072	0.3965	0.4286	0.4607	0.4822	0.5036	(22b)
Effective ac	0.6493	0.6435	0.6378	0.6111	0.6061	0.5829	0.5829	0.5786	0.5918	0.6061	0.6162	0.6268	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			9.7700	1.1450	11.1870			(27)
Heatloss Floor 1			46.6600	0.1300	6.0658			(28a)
External Wall	46.3200	11.6600	34.6600	0.1800	6.2388			(29a)
External Wall 2	11.0400		11.0400	0.1800	1.9872			(29a)
Total net area of external elements Aum(A, m2)			104.0200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.3688			(33)
Party Wall 1			13.4400	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								299.1363 (35)
Thermal bridges (User defined value 0.050 * total exposed area)								5.2010 (36)
Point Thermal bridges								(36a) = 0.0000
Total fabric heat loss								(33) + (36) + (36a) = 32.5698 (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	23.9951	23.7808	23.5708	22.5843	22.3998	21.5406	21.5406	21.3815	21.8716	22.3998	22.7732	23.1635 (38)
Average = Sum(39)m / 12 =	56.5649	56.3506	56.1406	55.1542	54.9696	54.1105	54.1105	53.9513	54.4414	54.9696	55.3430	55.7333 (39)
												55.1533
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2123	1.2077	1.2032	1.1820	1.1781	1.1597	1.1597	1.1563	1.1668	1.1781	1.1861	1.1945 (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	1.5924 (42)											
Hot water usage for mixer showers	65.3392	64.3573	62.9265	60.1888	58.1684	55.9154	54.6347	56.0548	57.6114	60.0305	62.8270	65.0889 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	30.9380	29.8129	28.6879	27.5629	26.4379	25.3129	25.3129	26.4379	27.5629	28.6879	29.8129	30.9380 (42c)
Average daily hot water use (litres/day)												88.3660 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.2772	94.1702	91.6144	87.7517	84.6063	81.2282	79.9476	82.4926	85.1743	88.7184	92.6399	96.0268 (44)
Energy content (annual)	152.4795	134.0972	140.8079	120.1277	113.8964	99.8796	96.6897	102.1431	105.0284	120.3900	131.9825	150.3548 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1467.8768

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	22.8719	20.1146	21.1212	18.0191	17.0845	14.9819	14.5035	15.3215	15.7543	18.0585	19.7974	22.5532 (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	49.0618	43.3441	46.6857	43.2748	43.1145	40.0578	40.7404	42.0373	42.0038	45.2099	45.6854	48.9342 (61)
Total heat required for water heating calculated for each month												
	201.5413	177.4413	187.4936	163.4025	157.0108	139.9374	137.4301	144.1805	147.0321	165.5999	177.6679	199.2890 (62)
WWHRS	-29.8704	-26.4176	-27.6630	-22.9060	-21.3476	-18.2673	-17.1227	-18.2083	-18.9001	-22.2811	-25.2418	-29.3172 (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												
	171.6709	151.0237	159.8306	140.4964	135.6632	121.6701	120.3074	125.9722	128.1321	143.3189	152.4262	169.9718 (64)
12Total per year (kWh/year)												1720.4835 (64)
Electric shower(s)												1720 (64)
	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)
												0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month												
	62.9649	55.4233	58.4900	50.7611	48.6492	43.2244	42.3344	44.4719	45.4229	51.3322	55.3055	62.2265 (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
	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	70.0984	77.6089	70.0984	72.4350	70.0984	72.4350	70.0984	70.0984	72.4350	70.0984	72.4350	70.0984 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	138.5689	140.0068	136.3833	128.6693	118.9318	109.7799	103.6659	102.2280	105.8515	113.5654	123.3030	132.4549 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621 (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)												
	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967 (71)
Water heating gains (Table 5)												
	84.6302	82.4752	78.6156	70.5016	65.3887	60.0339	56.9011	59.7741	63.0873	68.9948	76.8132	83.6378 (72)
Total internal gains												
	343.1838	349.9772	334.9836	321.4922	304.3051	289.1351	277.5517	278.9867	288.2601	302.5449	322.4375	336.0773 (73)

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				

Southeast			3.9900	36.7938	0.6300	0.7000	0.7700	44.8662 (77)				
Southwest			5.0300	36.7938	0.6300	0.7000	0.7700	56.5607 (79)				
Northwest			0.7500	11.2829	0.6300	0.7000	0.7700	2.5862 (81)				

Solar gains	104.0131	178.0318	245.8726	308.4726	349.0058	348.0175	334.8870	304.4126	267.5153	197.3783	124.7402	88.9123 (83)
Total gains	447.1969	528.0090	580.8562	629.9648	653.3109	637.1526	612.4387	583.3994	555.7754	499.9233	447.1777	424.9897 (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, n _{li,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	68.5432	68.8038	69.0612	70.2964	70.5324	71.6523	71.6523	71.8636	71.2168	70.5324	70.0566	69.5659
alpha	5.5695	5.5869	5.6041	5.6864	5.7022	5.7768	5.7768	5.7909	5.7478	5.7022	5.6704	5.6377
util living area	0.9918	0.9791	0.9516	0.8738	0.7304	0.5361	0.3877	0.4237	0.6511	0.9015	0.9801	0.9936 (86)
MIT	20.0132	20.2310	20.4847	20.7687	20.9326	20.9906	20.9988	20.9980	20.9726	20.7604	20.3456	19.9850 (87)
Th 2	19.9102	19.9139	19.9175	19.9344	19.9376	19.9524	19.9524	19.9551	19.9467	19.9376	19.9311	19.9244 (88)
util rest of house	0.9887	0.9717	0.9350	0.8354	0.6643	0.4519	0.2960	0.3284	0.5625	0.8618	0.9718	0.9912 (89)
MIT 2	18.7963	19.0720	19.3856	19.7254	19.8898	19.9481	19.9521	19.9546	19.9323	19.7281	19.2321	18.7713 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.5394 (91)
MIT	19.4528	19.6972	19.9785	20.2882	20.4523	20.5105	20.5167	20.5174	20.4935	20.2850	19.8328	19.4260 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4528	19.6972	19.9785	20.2882	20.4523	20.5105	20.5167	20.5174	20.4935	20.2850	19.8328	19.4260 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9871	0.9700	0.9361	0.8492	0.6975	0.4972	0.3456	0.3799	0.6097	0.8762	0.9709	0.9898 (94)

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Useful gains	441.4076	512.1475	543.7156	534.9563	455.6851	316.8187	211.6332	221.6282	338.8458	438.0272	434.1535	420.6452 (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	857.1138	833.8297	756.6922	628.1070	481.1128	319.8181	211.9350	222.1420	348.0705	532.3794	704.6685	848.5939 (97)
Space heating kwh	309.2855	216.1704	158.4546	67.0685	18.9182	0.0000	0.0000	0.0000	0.0000	70.1981	194.7708	318.3939 (98a)
Space heating requirement - total per year (kwh/year)												1353.2599
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	309.2855	216.1704	158.4546	67.0685	18.9182	0.0000	0.0000	0.0000	0.0000	70.1981	194.7708	318.3939 (98c)
Space heating requirement after solar contribution - total per year (kwh/year)												1353.2599
Space heating per m2										(98c) / (4) =		29.0026 (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	309.2855	216.1704	158.4546	67.0685	18.9182	0.0000	0.0000	0.0000	0.0000	70.1981	194.7708	318.3939 (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)	334.7245	233.9507	171.4877	72.5849	20.4743	0.0000	0.0000	0.0000	0.0000	75.9719	210.7909	344.5821 (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	171.6709	151.0237	159.8306	140.4964	135.6632	121.6701	120.3074	125.9722	128.1321	143.3189	152.4262	169.9718 (64)
Efficiency of water heater	85.6267	85.1493	84.3629	82.8910	81.2621	80.3000	80.3000	80.3000	80.3000	82.9378	84.9078	80.3000 (216)
Fuel for water heating, kWh/month	200.4876	177.3634	189.4560	169.4954	166.9453	151.5194	149.8225	156.8770	159.5667	172.8028	179.5197	198.3211 (219)
Space cooling fuel requirement	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)
(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	14.5651	11.6846	10.5207	7.7079	5.9538	4.8643	5.4313	7.0598	9.1700	12.0315	13.5895	14.9699 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-22.3110	-31.7090	-45.9699	-52.1868	-56.7556	-53.2126	-52.6116	-49.4575	-43.9236	-36.5376	-24.6397	-19.2640 (233a)
(233a)m	-22.3110	-31.7090	-45.9699	-52.1868	-56.7556	-53.2126	-52.6116	-49.4575	-43.9236	-36.5376	-24.6397	-19.2640 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)
(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)	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)
(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)	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)
(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)	-11.8487	-25.0072	-49.8322	-75.0091	-99.3068	-99.7699	-98.5409	-83.3318	-60.9818	-35.7546	-15.8228	-9.3591 (233b)
(233b)m	-11.8487	-25.0072	-49.8322	-75.0091	-99.3068	-99.7699	-98.5409	-83.3318	-60.9818	-35.7546	-15.8228	-9.3591 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)
(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)	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)
(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)	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)
(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												1464.5670 (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												2072.1769 (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)												117.5484 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1153.1437 (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												2587.1485 (238)

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

	Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	1464.5670	0.2100	307.5591 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2072.1769	0.2100	435.1571 (264)
Space and water heating			742.7162 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	117.5484	0.1443	16.9659 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-488.5790	0.1344	-65.6511
PV Unit electricity exported	-664.5647	0.1258	-83.6324
Total			-149.2835 (269)
Total CO2, kg/year			622.3278 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.3400 (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	1464.5670	1.1300	1654.9607 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2072.1769	1.1300	2341.5598 (278)
Space and water heating			3996.5205 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	117.5484	1.5338	180.2996 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-488.5790	1.4966	-731.2081
PV Unit electricity exported	-664.5647	0.4619	-306.9880
Total			-1038.1961 (283)
Total Primary energy kWh/year			3268.7248 (286)
Target Primary Energy Rate (TPER)			70.0500 (287)

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Property Reference	Unit 3	Issued on Date	07/08/2023
Assessment Reference	Baseline	Prop Type Ref	
Property	115, Tottenham Lane, London, N8 9BT		
SAP Rating	73 C	DER	29.51
Environmental	77 C	TER	11.94
CO ₂ Emissions (t/year)	1.63	% DER < TER	-147.15
Compliance Check	See BREL	DFEE	69.04
% DPER < TPER	-167.69	TFEE	30.87
		% DFEE < TFEE	-123.68
		TPER	62.52
Assessor Details	Mr. Tom Reynolds	Assessor ID	8440-0005
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	63.0400 (1b)	x 2.7000 (2b)	= 170.2080 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0400		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.2080 (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)

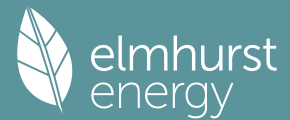
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test	0.0000 / (5) = 0.0000 (8)
Pressure Test Method	No
Measured/design AP50	Blower Door
Infiltration rate	15.0000 (17)
Number of sides sheltered	0.7500 (18)
	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7500 (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	0.9562	0.9375	0.9188	0.8250	0.8062	0.7125	0.7125	0.6938	0.7500	0.8062	0.8438	0.8813 (22b)
Mechanical extract ventilation - decentralised												
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)
Effective ac	1.2062	1.1875	1.1688	1.0750	1.0562	0.9625	0.9625	0.9438	1.0000	1.0562	1.0938	1.1313 (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
Door			1.6600	1.4000	2.3240		(26)
Windows (U _w = 1.40)			8.2100	1.3258	10.8845		(27)
External Wall 1	30.0200	9.8700	20.1500	0.3000	6.0450	150.0000	3022.5000 (29a)
External Wall 2	8.6400		8.6400	0.1800	1.5552	150.0000	1296.0000 (29a)

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External Roof	63.0400	63.0400	0.1600	10.0864	9.0000	567.3600 (30)
Total net area of external elements Aum(A, m2)	101.7000					(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =	30.8951			(33)
Party Wall 1	21.6500	0.0000	0.0000	70.0000	1515.5000	(32)
Party Floor 1	63.0400			30.0000	1891.2000	(32d)
Party Ceiling 1	63.0400			20.0000	1260.8000	(32b)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9553.3600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		151.5444 (35)
Thermal bridges (Default value 0.200 * total exposed area)		20.3400 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	51.2351 (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	67.7534	66.7003	65.6471	60.3813	59.3281	54.0623	54.0623	53.0092	56.1686	59.3281	61.4345	63.5408 (38)
Average = Sum(39)m / 12 =	118.9885	117.9353	116.8822	111.6164	110.5632	105.2974	105.2974	104.2442	107.4037	110.5632	112.6695	114.7758 (39)
	111.3531											
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.8875	1.8708	1.8541	1.7706	1.7539	1.6703	1.6703	1.6536	1.7037	1.7539	1.7873	1.8207 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

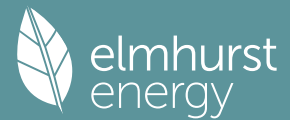
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0662 (42)
Hot water usage for mixer showers	78.8907	77.6829	75.9029	73.1647	70.7113	67.2790	64.5643	67.7380	69.3342	72.7337	76.2740	78.8196 (42a)
Hot water usage for baths	26.1778	25.7826	25.2204	24.3785	23.6198	22.5753	21.7829	22.7519	23.2604	24.2953	25.3713	26.1570 (42b)
Hot water usage for other uses	37.6731	36.3032	34.9333	33.5633	32.1934	30.8235	30.8235	32.1934	33.5633	34.9333	36.3032	37.6731 (42c)
Average daily hot water use (litres/day)												131.2524 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	142.7416	139.7687	136.0566	131.1065	126.5245	120.6778	117.1707	122.6833	126.1580	131.9623	137.9485	142.6497 (44)
Distribution loss (46)m = 0.15 x (45)m	210.1403	184.9422	194.4221	171.2579	163.0396	139.5599	129.4771	144.4005	146.3369	170.0468	186.4420	209.4915 (45)
	Total = Sum(45)m =											2049.5569
	31.5210	27.7413	29.1633	25.6887	24.4559	20.9340	19.4216	21.6601	21.9505	25.5070	27.9663	31.4237 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	261.0992	230.9696	245.3810	220.5730	213.9985	188.8750	180.4360	195.3594	195.6520	221.0057	235.7571	260.4504 (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	261.0992	230.9696	245.3810	220.5730	213.9985	188.8750	180.4360	195.3594	195.6520	221.0057	235.7571	260.4504 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2649.5569 (64)
Electric shower(s)												2650 (64)
	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	82.6114	73.0001	77.3851	69.2720	66.9504	58.7324	55.7909	60.7529	60.9858	69.2803	74.3207	82.3957 (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
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	99.2595	109.8945	99.2595	102.5682	99.2595	102.5682	99.2595	99.2595	102.5682	99.2595	102.5682	99.2595 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	180.5436	182.4171	177.6960	167.6453	154.9582	143.0340	135.0680	133.1945	137.9156	147.9663	160.6534	172.5776 (68)
Pumps, fans	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461 (71)
Total internal gains	111.0368	108.6312	104.0122	96.2111	89.9871	81.5728	74.9877	81.6571	84.7025	93.1187	103.2232	110.7469 (72)
	447.8323	457.9351	437.9600	423.4170	401.1971	381.1673	363.3075	368.1034	379.1786	397.3368	423.4372	439.5763 (73)

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				4.4200	11.2829	0.6300	0.7000	0.7700	15.2411 (75)			
Southwest				3.7900	36.7938	0.6300	0.7000	0.7700	42.6173 (79)			
Solar gains	57.8584	103.6168	155.2198	214.8639	261.2380	268.3980	254.9985	219.0178	175.6567	118.1442	70.2230	48.9182 (83)
Total gains	505.6907	561.5518	593.1799	638.2808	662.4351	649.5653	618.3060	587.1213	554.8353	515.4810	493.6601	488.4945 (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	22.3023	22.5014	22.7042	23.7753	24.0018	25.2021	25.2021	25.4567	24.7078	24.0018	23.5531	23.1208
alpha	2.4868	2.5001	2.5136	2.5850	2.6001	2.6801	2.6801	2.6971	2.6472	2.6001	2.5702	2.5414
util living area	0.9750	0.9660	0.9524	0.9185	0.8573	0.7415	0.6168	0.6522	0.8209	0.9275	0.9642	0.9770 (86)
MIT	17.9130	18.1873	18.6481	19.3788	20.0198	20.5828	20.8222	20.7895	20.3848	19.5697	18.6965	17.9571 (87)
Th 2	19.4094	19.4209	19.4324	19.4907	19.5025	19.5622	19.5622	19.5743	19.5382	19.5025	19.4789	19.4556 (88)
util rest of house	0.9690	0.9578	0.9399	0.8949	0.8096	0.6451	0.4610	0.5041	0.7442	0.9018	0.9541	0.9716 (89)
MIT 2	16.7071	16.9847	17.4465	18.1950	18.8077	19.3376	19.5039	19.4981	19.1695	18.3966	17.5270	16.7788 (90)
Living area fraction									fLA = Living area / (4) =			0.4673 (91)
MIT	17.2707	17.5467	18.0080	18.7482	19.3741	19.9195	20.1200	20.1016	19.7374	18.9448	18.0736	17.3294 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.1207	17.3967	17.8580	18.5982	19.2241	19.7695	19.9700	19.9516	19.5874	18.7948	17.9236	17.1794 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9562	0.9426	0.9224	0.8767	0.7987	0.6612	0.5105	0.5485	0.7473	0.8855	0.9394	0.9597 (94)
Useful gains	483.5174	529.3049	547.1511	559.5784	529.0654	429.4971	315.6315	322.0346	414.6554	456.4592	463.7243	468.8117 (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	1525.5109	1473.8038	1327.5497	1082.4793	831.8928	544.3319	354.8481	370.2328	589.3690	906.0427	1219.4858	1489.7234 (97)
Space heating kWh	775.2432	634.7032	580.6165	376.4886	225.3035	0.0000	0.0000	0.0000	0.0000	334.4901	544.1483	759.5583 (98a)
Space heating requirement - total per year (kWh/year)												4230.5519
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	775.2432	634.7032	580.6165	376.4886	225.3035	0.0000	0.0000	0.0000	0.0000	334.4901	544.1483	759.5583 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4230.5519
Space heating per m2										(98c) / (4) =		67.1090 (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 %)												84.0000 (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	775.2432	634.7032	580.6165	376.4886	225.3035	0.0000	0.0000	0.0000	0.0000	334.4901	544.1483	759.5583 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	922.9086	755.5991	691.2102	448.2008	268.2185	0.0000	0.0000	0.0000	0.0000	398.2025	647.7956	904.2361 (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	261.0992	230.9696	245.3810	220.5730	213.9985	188.8750	180.4360	195.3594	195.6520	221.0057	235.7571	260.4504 (64)
Efficiency of water heater												75.0000 (216)
(217)m	81.5349	81.3940	81.1086	80.4342	79.3609	75.0000	75.0000	75.0000	75.0000	80.1724	81.0596	81.5027 (217)
Fuel for water heating, kWh/month	320.2298	283.7674	302.5339	274.2278	269.6524	251.8333	240.5814	260.4792	260.8693	275.6631	290.8442	319.5606 (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	42.5768	38.4565	42.5768	41.2034	42.5768	41.2034	42.5768	42.5768	41.2034	42.5768	41.2034	42.5768 (231)

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Lighting	25.4558	20.4216	18.3874	13.4714	10.4057	8.5015	9.4924	12.3386	16.0266	21.0278	23.7509	26.1633 (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												5036.3713 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												3350.2424 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEV)Decentralised, Table 4g: in-use factor = 2.5000, SFP = 2.0000)												
mechanical ventilation fans (SFP = 2.0000)												415.3075 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												501.3075 (231)
Electricity for lighting (calculated in Appendix L)												205.4431 (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												9093.3643 (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	5036.3713	0.2100	1057.6380 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3350.2424	0.2100	703.5509 (264)
Space and water heating			1761.1889 (265)
Pumps, fans and electric keep-hot	501.3075	0.1387	69.5375 (267)
Energy for lighting	205.4431	0.1443	29.6518 (268)
Total CO2, kg/year			1860.3782 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			29.5100 (273)

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

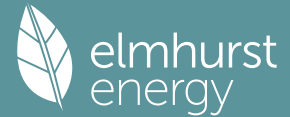
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	5036.3713	1.1300	5691.0995 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3350.2424	1.1300	3785.7739 (278)
Space and water heating			9476.8734 (279)
Pumps, fans and electric keep-hot	501.3075	1.5128	758.3780 (281)
Energy for lighting	205.4431	1.5338	315.1156 (282)
Total Primary energy kWh/year			10550.3670 (286)
Dwelling Primary energy Rate (DPER)			167.3600 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	63.0400 (1b)	x 2.7000 (2b)	= 170.2080 (1b) -

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Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 63.0400 (4)
 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 170.2080 (5)

2. Ventilation rate

	m3 per hour											
Number of open chimneys	0 * 80 =	0.0000	(6a)									
Number of open flues	0 * 20 =	0.0000	(6b)									
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)									
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)									
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)									
Number of blocked chimneys	0 * 20 =	0.0000	(6f)									
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)									
Number of passive vents	0 * 10 =	0.0000	(7b)									
Number of flueless gas fires	0 * 40 =	0.0000	(7c)									
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1175	(8)									
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	5.0000	(17)										
Infiltration rate	0.3675	(18)										
Number of sides sheltered	0	(19)										
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)									
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3675	(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	0.4686	0.4594	0.4502	0.4043	0.3951	0.3491	0.3491	0.3399	0.3675	0.3951	0.4134	0.4318	(22b)
Effective ac	0.6098	0.6055	0.6013	0.5817	0.5780	0.5609	0.5609	0.5578	0.5675	0.5780	0.5855	0.5932	(25)

3. Heat losses and heat loss parameter

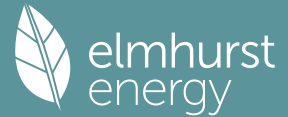
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.6600	1.0000	1.6600			(26)
TER Opening Type (Uw = 1.20)			8.2100	1.1450	9.4008			(27)
External Wall 1	30.0200	9.8700	20.1500	0.1800	3.6270			(29a)
External Wall 2	8.6400		8.6400	0.1800	1.5552			(29a)
External Roof	63.0400		63.0400	0.1100	6.9344			(30)
Total net area of external elements Aum(A, m2)			101.7000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.1774			(33)
Party Wall 1			21.6500	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								161.5444 (35)
Thermal bridges (User defined value 0.050 * total exposed area)								5.0850 (36)
Point Thermal bridges								(36a) = 0.0000
Total fabric heat loss								(33) + (36) + (36a) = 28.2624 (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	34.2504	34.0109	33.7762	32.6739	32.4676	31.5075	31.5075	31.3297	31.8774	32.4676	32.8849	33.3211 (38)
Average = Sum(39)m / 12 =	62.5127	62.2733	62.0386	60.9363	60.7300	59.7699	59.7699	59.5921	60.1397	60.7300	61.1472	61.5834 (39)
												60.9353
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9916	0.9878	0.9841	0.9666	0.9634	0.9481	0.9481	0.9453	0.9540	0.9634	0.9700	0.9769 (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	2.0662 (42)											
Hot water usage for mixer showers	58.8622	57.9776	56.6886	54.2223	52.4022	50.3725	49.2188	50.4981	51.9004	54.0797	56.5990	58.6367 (42a)
Hot water usage for baths	25.4359	25.0581	24.5262	23.5453	22.8109	21.9965	21.5566	22.0849	22.6600	23.5314	24.5325	25.3499 (42b)
Hot water usage for other uses	35.7895	34.4880	33.1866	31.8852	30.5837	29.2823	29.2823	30.5837	31.8852	33.1866	34.4880	35.7895 (42c)
Average daily hot water use (litres/day)												110.3880 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	120.0876	117.5238	114.4014	109.6528	105.7969	101.6513	100.0578	103.1667	106.4456	110.7977	115.6195	119.7761 (44)
Energy content (annual)	190.1894	167.3523	175.8307	150.1092	142.4229	124.9922	121.0112	127.7419	131.2580	150.3515	164.7212	187.5404 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1833.5208

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	28.5284	25.1028	26.3746	22.5164	21.3634	18.7488	18.1517	19.1613	19.6887	22.5527	24.7082	28.1311 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	241.1483	213.3797	226.7896	199.4243	193.3818	174.3072	171.9701	178.7008	180.5731	201.3104	214.0362	238.4993 (62)
WWHRS	-26.9093	-23.7988	-24.9208	-20.6354	-19.2314	-16.4565	-15.4253	-16.4033	-17.0265	-20.0724	-22.7396	-26.4110 (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												
	214.2389	189.5809	201.8688	178.7889	174.1504	157.8508	156.5448	162.2975	163.5466	181.2380	191.2967	212.0883 (64)
12Total per year (kWh/year)												2183 (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)
												0.0000 (64a)
Heat gains from water heating, kWh/month												
	75.9777	67.1515	71.2034	62.2401	60.0953	53.8887	52.9759	55.2139	55.9721	62.7316	67.0986	75.0969 (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	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.2595	109.8945	99.2595	102.5682	99.2595	102.5682	99.2595	99.2595	102.5682	99.2595	102.5682	99.2595 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.5436	182.4171	177.6960	167.6453	154.9582	143.0340	135.0680	133.1945	137.9156	147.9663	160.6534	172.5776 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308 (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)	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461 (71)
Water heating gains (Table 5)	102.1206	99.9278	95.7035	86.4446	80.7733	74.8454	71.2042	74.2122	77.7390	84.3167	93.1924	100.9367 (72)
Total internal gains	438.9160	449.2317	429.6514	413.6504	391.9833	374.4399	359.5240	360.6586	372.2151	388.5348	413.4063	429.7661 (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				
Northeast			4.4200	11.2829	0.6300	0.7000	0.7700	15.2411 (75)				
Southwest			3.7900	36.7938	0.6300	0.7000	0.7700	42.6173 (79)				
Solar gains	57.8584	103.6168	155.2198	214.8639	261.2380	268.3980	254.9985	219.0178	175.6567	118.1442	70.2230	48.9182 (83)
Total gains	496.7744	552.8485	584.8712	628.5143	653.2213	642.8379	614.5225	579.6764	547.8718	506.6790	483.6293	478.6843 (84)

7. Mean internal temperature (heating season)

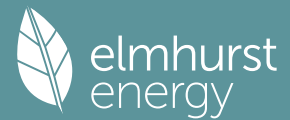
Temperature during heating periods in the living area from Table 9, Th1 (C)

Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.2519	45.4259	45.5978	46.4226	46.5803	47.3285	47.3285	47.4698	47.0375	46.5803	46.2625	45.9348
alpha	4.0168	4.0284	4.0399	4.0948	4.1054	4.1552	4.1552	4.1647	4.1358	4.1054	4.0842	4.0623
util living area	0.9728	0.9571	0.9306	0.8621	0.7417	0.5651	0.4207	0.4616	0.6808	0.8815	0.9543	0.9760 (86)
MIT	19.6211	19.8344	20.1246	20.5161	20.8011	20.9521	20.9889	20.9838	20.8957	20.5417	20.0393	19.5992 (87)
Th 2	20.0903	20.0935	20.0966	20.1112	20.1140	20.1268	20.1268	20.1292	20.1218	20.1140	20.1084	20.1026 (88)
util rest of house	0.9675	0.9488	0.9171	0.8357	0.6953	0.4976	0.3404	0.3790	0.6151	0.8531	0.9442	0.9713 (89)
MIT 2	18.4920	18.7618	19.1254	19.6096	19.9333	20.0935	20.1216	20.1210	20.0417	19.6512	19.0331	18.4731 (90)
Living area fraction												
MIT	19.0196	19.2630	19.5923	20.0332	20.3389	20.4947	20.5269	20.5242	20.4408	20.0674	19.5033	18.9993 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0196	19.2630	19.5923	20.0332	20.3389	20.4947	20.5269	20.5242	20.4408	20.0674	19.5033	18.9993 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9595	0.9396	0.9082	0.8332	0.7077	0.5268	0.3776	0.4170	0.6401	0.8514	0.9358	0.9639 (94)
Useful gains	476.6424	519.4801	531.1641	523.6534	462.2852	338.6234	232.0318	241.7502	350.6662	431.3792	452.5804	461.4065 (95)

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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	920.1646	894.4331	812.2292	678.4180	524.6377	352.3281	234.7091	245.7698	381.3332	574.9533	758.4303	911.3940 (97)
Space heating kWh	329.9805	251.9684	209.1124	111.4305	46.3903	0.0000	0.0000	0.0000	0.0000	106.8192	220.2120	334.7907 (98a)
Space heating requirement - total per year (kWh/year)												1610.7040
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	329.9805	251.9684	209.1124	111.4305	46.3903	0.0000	0.0000	0.0000	0.0000	106.8192	220.2120	334.7907 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1610.7040
Space heating per m2										(98c) / (4) =		25.5505 (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	329.9805	251.9684	209.1124	111.4305	46.3903	0.0000	0.0000	0.0000	0.0000	106.8192	220.2120	334.7907 (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)	357.1218	272.6931	226.3121	120.5958	50.2059	0.0000	0.0000	0.0000	0.0000	115.6052	238.3247	362.3276 (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	214.2389	189.5809	201.8688	178.7889	174.1504	157.8508	156.5448	162.2975	163.5466	181.2380	191.2967	212.0883 (64)
Efficiency of water heater (217)m	85.3035	84.9918	84.4571	83.3976	81.9679	80.3000	80.3000	80.3000	80.3000	83.2878	84.6839	80.3000 (216)
Fuel for water heating, kWh/month	251.1489	223.0578	239.0193	214.3813	212.4616	196.5763	194.9499	202.1140	203.6695	217.6046	225.8950	85.3548 (217)
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	248.4783 (219)
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	0.0000 (221)
Lighting	20.6242	16.5455	14.8974	10.9144	8.4306	6.8879	7.6907	9.9967	12.9847	17.0366	19.2428	0.0000 (221)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-29.7927	-42.1521	-60.8085	-68.6395	-74.2643	-69.4371	-68.6172	-64.6840	-57.7372	-48.3682	-32.8224	-25.7431 (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	-16.3587	-34.4744	-68.6249	-103.2085	-136.5839	-137.2500	-135.5973	-114.7209	-83.9952	-49.3021	-21.8446	-12.9281 (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												1743.1862 (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												2629.3565 (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)												166.4489 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1557.9550 (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												3067.0365 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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Space heating - main system 1	1743.1862	0.2100	366.0691 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2629.3565	0.2100	552.1649 (264)
Space and water heating			918.2340 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	166.4489	0.1443	24.0237 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-643.0664	0.1345	-86.4905
PV Unit electricity exported	-914.8886	0.1259	-115.1503
Total			-201.6407 (269)
Total CO2, kg/year			752.5462 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9400 (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	1743.1862	1.1300	1969.8004 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2629.3565	1.1300	2971.1728 (278)
Space and water heating			4940.9732 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	166.4489	1.5338	255.3048 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-643.0664	1.4971	-962.7173
PV Unit electricity exported	-914.8886	0.4620	-422.6797
Total			-1385.3970 (283)
Total Primary energy kWh/year			3940.9818 (286)
Target Primary Energy Rate (TPER)			62.5200 (287)

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Property Reference	Unit 4	Issued on Date	07/08/2023
Assessment Reference	Baseline	Prop Type Ref	
Property	155, Tottenham Lane, London, N8 9BT		
SAP Rating	70 C	DER	39.04
Environmental	74 C	TER	14.55
CO ₂ Emissions (t/year)	1.61	% DER < TER	-168.32
Compliance Check	See BREL	DFEE	91.71
% DPER < TPER	-185.89	TFEE	41.11
		% DFEE < TFEE	-123.11
		TPER	76.59
Assessor Details	Mr. Tom Reynolds	Assessor ID	8440-0005
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	47.2000 (1b)	x 2.7000 (2b)	= 127.4400 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.2000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 127.4400 (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) =	Air changes per hour
Pressure test	0.0000 / (5) = 0.0000 (8)
Pressure Test Method	No
Measured/design AP50	Blower Door
Infiltration rate	15.0000 (17)
Number of sides sheltered	0.7500 (18)
	0 (19)

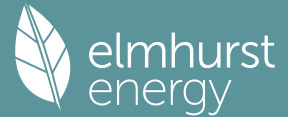
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7500 (21)

	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	0.9562	0.9375	0.9188	0.8250	0.8062	0.7125	0.7125	0.6938	0.7500	0.8062	0.8438	0.8813 (22b)
Mechanical extract ventilation - decentralised												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)												
Effective ac	1.2062	1.1875	1.1688	1.0750	1.0562	0.9625	0.9625	0.9438	1.0000	1.0562	1.0938	1.1313 (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
Windows (Uw = 1.40)			8.9900	1.3258	11.9186		(27)
External Wall 1	52.1100	4.1300	47.9800	0.3000	14.3940	150.0000	7197.0000 (29a)
External Wall 2	12.4200	4.8600	7.5600	0.1800	1.3608	150.0000	1134.0000 (29a)
External Roof 1	47.2200		47.2200	0.1600	7.5552	9.0000	424.9800 (30)

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Total net area of external elements Aum(A, m2)	111.7500											(31)
Fabric heat loss, W/K = Sum(A x U)	(26)...(30) + (32) =	35.2286										(33)
Party Wall 1	13.4400	0.0000										(32)
Party Floor 1	47.2200											(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11113.3800										(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												(35)
Thermal bridges (Default value 0.200 * total exposed area)												(36)
Point Thermal bridges												(36a) =
Total fabric heat loss	(33) + (36) + (36a) =	57.5786										(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	50.7291	49.9406	49.1520	45.2093	44.4208	40.4781	40.4781	39.6896	42.0552	44.4208	45.9979	47.5749 (38)
Average = Sum(39)m / 12 =	108.3076	107.5191	106.7306	102.7879	101.9994	98.0567	98.0567	97.2682	99.6338	101.9994	103.5764	105.1535 (39)
												102.5908

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	2.2947	2.2779	2.2612	2.1777	2.1610	2.0775	2.0775	2.0608	2.1109	2.1610	2.1944	2.2278	(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													1.6081 (42)
Hot water usage for mixer showers													
	90.3072	88.9501	86.9724	83.1886	80.3963	77.2822	75.5122	77.4749	79.6263	82.9698	86.8349	89.9612 (42a)	
Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)	
Hot water usage for other uses													
	32.7352	31.5449	30.3545	29.1641	27.9738	26.7834	26.7834	27.9738	29.1641	30.3545	31.5449	32.7352 (42c)	
Average daily hot water use (litres/day)												113.0195 (43)	

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	123.0425	120.4949	117.3269	112.3527	108.3700	104.0656	102.2956	105.4486	108.7904	113.3243	118.3798	122.6964	(44)
Energy content (annual)	194.8692	171.5832	180.3271	153.8053	145.8869	127.9608	123.7177	130.5674	134.1495	153.7800	168.6537	192.1130	(45)
Distribution loss (46)m = 0.15 x (45)m	29.2304	25.7375	27.0491	23.0708	21.8830	19.1941	18.5577	19.5851	20.1224	23.0670	25.2981	28.8169	(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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	245.8281	217.6106	231.2860	203.1204	196.8458	177.2759	174.6766	181.5263	183.4646	204.7389	217.9688	243.0719	(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	245.8281	217.6106	231.2860	203.1204	196.8458	177.2759	174.6766	181.5263	183.4646	204.7389	217.9688	243.0719	(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	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)

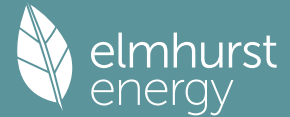
Heat gains from water heating, kWh/month	77.5337	68.5583	72.6985	63.4690	61.2471	54.8757	53.8759	56.1534	56.9335	63.8716	68.4061	76.6173	(65)
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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	71.5094	79.1711	71.5094	73.8930	71.5094	73.8930	71.5094	71.5094	73.8930	71.5094	73.8930	71.5094	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	139.9674	141.4198	137.7597	129.9679	120.1321	110.8878	104.7121	103.2597	106.9198	114.7116	124.5474	133.7916	(68)
Pumps, fans	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	(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)	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	(71)
Total internal gains	104.2120	102.0212	97.7130	88.1514	82.3214	76.2163	72.4138	75.4750	79.0743	85.8489	95.0085	102.9802	(72)
	365.8101	372.7335	357.1035	342.1337	324.0842	308.1186	295.7567	297.3655	307.0084	322.1913	343.5703	358.4026	(73)

6. Solar gains

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[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W		
Northeast			0.8900		11.2829		0.6300		0.7000		0.7700		3.0689 (75)		
Southwest			3.2400		36.7938		0.6300		0.7000		0.7700		36.4327 (79)		
Northwest			4.8600		11.2829		0.6300		0.7000		0.7700		16.7583 (81)		

Solar gains			56.2600	102.4173	157.6250	224.6260	278.3628	288.1219	272.8813	230.9915	180.5437	117.9096	68.5858	47.3707 (83)	
Total gains			422.0701	475.1508	514.7285	566.7598	602.4470	596.2405	568.6379	528.3569	487.5522	440.1008	412.1561	405.7734 (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	28.5026	28.7116	28.9238	30.0332	30.2654	31.4823	31.4823	31.7375	30.9840	30.2654	29.8046	29.3576			
alpha	2.9002	2.9141	2.9283	3.0022	3.0177	3.0988	3.0988	3.1158	3.0656	3.0177	2.9870	2.9572			
util living area	0.9887	0.9831	0.9731	0.9463	0.8894	0.7750	0.6439	0.6909	0.8653	0.9576	0.9829	0.9900	(86)		
MIT	18.2816	18.5242	18.9443	19.5921	20.1764	20.6654	20.8679	20.8329	20.4657	19.7242	18.9464	18.3053	(87)		
Th 2	19.1441	19.1545	19.1649	19.2175	19.2282	19.2822	19.2822	19.2931	19.2604	19.2282	19.2069	19.1858	(88)		
util rest of house	0.9847	0.9770	0.9625	0.9227	0.8336	0.6502	0.4387	0.4948	0.7737	0.9342	0.9755	0.9865	(89)		
MIT 2	16.8151	17.0617	17.4831	18.1477	18.6981	19.1377	19.2548	19.2526	18.9850	18.2924	17.5159	16.8649	(90)		
Living area fraction	fLA = Living area / (4) =												0.5282 (91)		
MIT	17.5897	17.8342	18.2549	18.9106	19.4789	19.9445	20.1068	20.0873	19.7670	19.0487	18.2715	17.6257	(92)		
Temperature adjustment														0.0000	
adjusted MIT	17.5897	17.8342	18.2549	18.9106	19.4789	19.9445	20.1068	20.0873	19.7670	19.0487	18.2715	17.6257	(93)		

8. Space heating requirement															

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisation	0.9797	0.9708	0.9552	0.9174	0.8433	0.7053	0.5471	0.5970	0.8063	0.9310	0.9700	0.9820	(94)		
Useful gains	413.4972	461.2611	491.6862	519.9725	508.0553	420.5156	311.0971	315.4312	393.1118	409.7140	399.8004	398.4786	(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	1439.3714	1390.6708	1254.6045	1028.9704	793.4397	524.0687	343.8674	358.6577	564.6295	861.7582	1157.1040	1411.7588	(97)		
Space heating kWh	763.2504	624.5633	567.6112	366.4784	212.3261	0.0000	0.0000	0.0000	0.0000	336.3208	545.2586	753.8805	(98a)		
Space heating requirement - total per year (kWh/year)													4169.6893		
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	763.2504	624.5633	567.6112	366.4784	212.3261	0.0000	0.0000	0.0000	0.0000	336.3208	545.2586	753.8805	(98c)		
Space heating requirement after solar contribution - total per year (kWh/year)													4169.6893		
Space heating per m2													(98c) / (4) = 88.3409 (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 %)													79.0000 (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	763.2504	624.5633	567.6112	366.4784	212.3261	0.0000	0.0000	0.0000	0.0000	336.3208	545.2586	753.8805	(98)		
Space heating efficiency (main heating system 1)	79.0000	79.0000	79.0000	79.0000	79.0000	0.0000	0.0000	0.0000	0.0000	79.0000	79.0000	79.0000	(210)		
Space heating fuel (main heating system)	966.1398	790.5865	718.4952	463.8967	268.7672	0.0000	0.0000	0.0000	0.0000	425.7226	690.2008	954.2791	(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	245.8281	217.6106	231.2860	203.1204	196.8458	177.2759	174.6766	181.5263	183.4646	204.7389	217.9688	243.0719	(64)		
Efficiency of water heater	81.6141	81.4737	81.1798	80.5530	79.4154	75.0000	75.0000	75.0000	75.0000	80.3514	81.2167	81.6122	(216)		
Fuel for water heating, kWh/month	301.2079	267.0929	284.9061	252.1576	247.8687	236.3678	232.9021	242.0351	244.6194	254.8045	268.3794	297.8377	(219)		
Space cooling fuel requirement	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	33.7139	30.4512	33.7139	32.6263	33.7139	32.6263	33.7139	33.7139	32.6263	33.7139	32.6263	33.7139	(231)		
Lighting	18.8320	15.1077	13.6028	9.9660	7.6980	6.2894	7.0224	9.1280	11.8564	15.5562	17.5707	19.3554	(232)		

elmhurst
energy

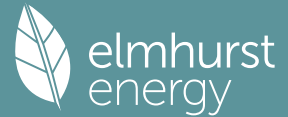
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP			
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5278.0877	0.2100	1108.3984 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3130.1791	0.2100	657.3376 (264)
Space and water heating			1765.7360 (265)
Pumps, fans and electric keep-hot	396.9536	0.1387	55.0624 (267)
Energy for lighting	151.9851	0.1443	21.9362 (268)
Total CO2, kg/year			1842.7346 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			39.0400 (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	5278.0877	1.1300	5964.2391	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3130.1791	1.1300	3537.1024	(278)
Space and water heating			9501.3416	(279)
Pumps, fans and electric keep-hot	396.9536	1.5128	600.5114	(281)
Energy for lighting	151.9851	1.5338	233.1199	(282)
Total Primary energy kWh/year			10334.9729	(286)
Dwelling Primary energy Rate (DPER)			218.9600	(287)

1. Overall dwelling characteristics

		Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor		47.2000 (1b)	x 2.7000 (2b)	= 127.4400 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.2000			

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Dwelling volume

(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 127.4400 (5)

2. Ventilation rate

m3 per hour

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1569 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4069	(18)
Number of sides sheltered		0	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4069 (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													
	0.5188	0.5087	0.4985	0.4476	0.4375	0.3866	0.3866	0.3764	0.4069	0.4375	0.4578	0.4782	(22b)
Effective ac	0.6346	0.6294	0.6242	0.6002	0.5957	0.5747	0.5747	0.5708	0.5828	0.5957	0.6048	0.6143	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			8.9900	1.1450	10.2939			(27)
External Wall 1	52.1100	4.1300	47.9800	0.1800	8.6364			(29a)
External Wall 2	12.4200	4.8600	7.5600	0.1800	1.3608			(29a)
External Roof 1	47.2200		47.2200	0.1100	5.1942			(30)
Total net area of external elements Aum(A, m2)			111.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.4853			(33)
Party Wall 1			13.4400	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													235.4530 (35)
Thermal bridges (User defined value 0.050 * total exposed area)													5.5875 (36)
Point Thermal bridges													0.0000 (36a)
Total fabric heat loss													(33) + (36) + (36a) = 31.0728 (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	26.6882	26.4684	26.2529	25.2410	25.0516	24.1702	24.1702	24.0070	24.5097	25.0516	25.4347	25.8351	(38)
Heat transfer coeff	57.7610	57.5412	57.3257	56.3138	56.1244	55.2430	55.2430	55.0798	55.5825	56.1244	56.5074	56.9079	(39)
Average = Sum(39)m / 12 =													56.3128

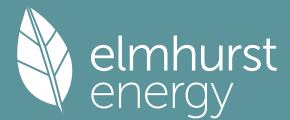
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2238	1.2191	1.2145	1.1931	1.1891	1.1704	1.1704	1.1669	1.1776	1.1891	1.1972	1.2057	(40)
HLP (average)													1.1931
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6081 (42)
Hot water usage for mixer showers													
	65.6780	64.6910	63.2527	60.5008	58.4700	56.2053	54.9180	56.3454	57.9100	60.3417	63.1527	65.4263	(42a)
Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
	31.0985	29.9676	28.8368	27.7059	26.5751	25.4442	25.4442	26.5751	27.7059	28.8368	29.9676	31.0985	(42c)
Average daily hot water use (litres/day)													88.8242 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.7765	94.6586	92.0895	88.2067	85.0451	81.6495	80.3622	82.9204	85.6160	89.1785	93.1203	96.5248	(44)
Energy conte	153.2702	134.7926	141.5381	120.7506	114.4870	100.3976	97.1911	102.6728	105.5730	121.0143	132.6669	151.1345	(45)
Energy content (annual)													Total = Sum(45)m = 1475.4888
Distribution loss (46)m = 0.15 x (45)m													
	22.9905	20.2189	21.2307	18.1126	17.1731	15.0596	14.5787	15.4009	15.8360	18.1522	19.9000	22.6702	(46)
Water storage loss:													

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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	49.3162	43.5689	46.9278	43.4992	43.3380	40.2655	40.9517	42.2553	42.2216	45.4444	45.9223	49.1880 (61)
Total heat required for water heating calculated for each month	202.5865	178.3614	188.4658	164.2498	157.8250	140.6630	138.1428	144.9282	147.7946	166.4587	178.5893	200.3225 (62)
WWHRS	-30.0252	-26.5546	-27.8064	-23.0248	-21.4583	-18.3620	-17.2115	-18.3027	-18.9980	-22.3966	-25.3726	-29.4692 (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	172.5612	151.8069	160.6594	141.2250	136.3668	122.3010	120.9313	126.6255	128.7966	144.0621	153.2167	170.8533 (64)
	Total per year (kWh/year) = Sum(64)m =											1729.4059 (64)
12Total per year (kWh/year)												1729 (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	63.2914	55.7107	58.7934	51.0244	48.9014	43.4486	42.5540	44.7025	45.6584	51.5984	55.5923	62.5492 (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	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.5094	79.1711	71.5094	73.8930	71.5094	73.8930	71.5094	71.5094	73.8930	71.5094	73.8930	71.5094	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	139.9674	141.4198	137.7597	129.9679	120.1321	110.8878	104.7121	103.2597	106.9198	114.7116	124.5474	133.7916	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	(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)	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	(71)
Water heating gains (Table 5)	85.0691	82.9029	79.0233	70.8672	65.7277	60.3452	57.1962	60.0841	63.4145	69.3526	77.2116	84.0715	(72)
Total internal gains	346.6672	353.6152	338.4138	324.8495	307.4906	292.2475	280.5391	281.9745	291.3486	305.6950	325.7734	339.4939	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast				0.8900	11.2829		0.6300		0.7000		0.7700		3.0689 (75)
Southwest				3.2400	36.7938		0.6300		0.7000		0.7700		36.4327 (79)
Northwest				4.8600	11.2829		0.6300		0.7000		0.7700		16.7583 (81)
Solar gains	56.2600	102.4173	157.6250	224.6260	278.3628	288.1219	272.8813	230.9915	180.5437	117.9096	68.5858	47.3707	(83)
Total gains	402.9272	456.0325	496.0388	549.4755	585.8534	580.3694	553.4203	512.9660	471.8924	423.6045	394.3592	386.8647	(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	53.4452	53.6494	53.8510	54.8188	55.0037	55.8813	55.8813	56.0469	55.5400	55.0037	54.6309	54.2464
alpha	4.5630	4.5766	4.5901	4.6546	4.6669	4.7254	4.7254	4.7365	4.7027	4.6669	4.6421	4.6164
util living area	0.9891	0.9798	0.9601	0.8990	0.7729	0.5849	0.4341	0.4849	0.7300	0.9266	0.9792	0.9908 (86)
MIT	19.6711	19.8731	20.1652	20.5574	20.8366	20.9665	20.9933	20.9890	20.9075	20.5483	20.0580	19.6508 (87)
Th 2	19.9010	19.9048	19.9084	19.9255	19.9287	19.9438	19.9438	19.9465	19.9380	19.9287	19.9222	19.9155 (88)
util rest of house	0.9858	0.9738	0.9480	0.8695	0.7140	0.4982	0.3325	0.3784	0.6458	0.8984	0.9720	0.9880 (89)
MIT 2	18.3830	18.6406	19.0079	19.4918	19.7968	19.9253	19.9417	19.9427	19.8779	19.4951	18.8892	18.3676 (90)
Living area fraction	fLA = Living area / (4) =											0.5282 (91)
MIT	19.0633	19.2916	19.6192	20.0546	20.3460	20.4752	20.4971	20.4954	20.4217	20.0514	19.5065	19.0454 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0633	19.2916	19.6192	20.0546	20.3460	20.4752	20.4971	20.4954	20.4217	20.0514	19.5065	19.0454 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	395.8718	442.1760	468.3337	479.9265	432.5406	315.0455	213.7629	222.9677	323.8280	382.1501	381.9365	381.0951 (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)

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Heat loss rate W	852.7454	828.1095	752.0656	628.1600	485.2513	324.5663	215.2885	225.5715	351.3778	530.4525	701.0599	844.8184 (97)
Space heating kWh	339.9139	259.3473	211.0965	106.7281	39.2168	0.0000	0.0000	0.0000	0.0000	110.3369	229.7688	345.0101 (98a)
Space heating requirement - total per year (kWh/year)												1641.4186
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	339.9139	259.3473	211.0965	106.7281	39.2168	0.0000	0.0000	0.0000	0.0000	110.3369	229.7688	345.0101 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1641.4186
Space heating per m2										(98c) / (4) =		34.7758 (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	339.9139	259.3473	211.0965	106.7281	39.2168	0.0000	0.0000	0.0000	0.0000	110.3369	229.7688	345.0101 (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)	367.8722	280.6789	228.4595	115.5066	42.4424	0.0000	0.0000	0.0000	0.0000	119.4123	248.6676	373.3876 (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	172.5612	151.8069	160.6594	141.2250	136.3668	122.3010	120.9313	126.6255	128.7966	144.0621	153.2167	170.8533 (64)
Efficiency of water heater	85.8057	85.5183	84.9674	83.7889	82.0733	80.3000	80.3000	80.3000	80.3000	83.8167	85.2475	85.8547 (216)
Fuel for water heating, kWh/month	201.1071	177.5138	189.0837	168.5485	166.1524	152.3052	150.5994	157.6905	160.3942	171.8776	179.7315	199.0029 (219)
Space cooling fuel requirement	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)
(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	14.8582	11.9198	10.7325	7.8631	6.0737	4.9622	5.5406	7.2019	9.3545	12.2737	13.8631	15.2712 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-22.5608	-32.0589	-46.4682	-52.7401	-57.3447	-53.7585	-53.1510	-49.9715	-44.3902	-36.9358	-24.9138	-19.4803 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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)	-11.9942	-25.3137	-50.4426	-75.9278	-100.5239	-100.9945	-99.7508	-84.3545	-61.7292	-36.1930	-16.0170	-9.4741 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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												1776.4270 (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												2074.0070 (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)												119.9145 (232)
Energy saving/generation technologies (Appendices M, N and Q)												
PV generation												-1166.4891 (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												2889.8593 (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	1776.4270	0.2100	373.0497 (261)

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Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2074.0070	0.2100	435.5415 (264)
Space and water heating			808.5911 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	119.9145	0.1443	17.3074 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-493.7738	0.1344	-66.3515
PV Unit electricity exported	-672.7153	0.1258	-84.6580
Total			-151.0096 (269)
Total CO2, kg/year			686.8182 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.5500 (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	1776.4270	1.1300	2007.3625 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2074.0070	1.1300	2343.6279 (278)
Space and water heating			4350.9904 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	119.9145	1.5338	183.9288 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-493.7738	1.4966	-738.9919
PV Unit electricity exported	-672.7153	0.4619	-310.7526
Total			-1049.7444 (283)
Total Primary energy kWh/year			3615.2756 (286)
Target Primary Energy Rate (TPER)			76.5900 (287)



Appendix 2

'As-Designed' SAP Worksheets

Full SAP Calculation Printout



Property Reference	Unit 1				Issued on Date	07/08/2023
Assessment Reference	Be Lean		Prop Type Ref			
Property	Unit 1, 15, Tottenham Lane, London, N8 9BT					
SAP Rating	74 C	DER	28.45	TER	10.68	
Environmental	78 C	% DER < TER				-166.39
CO ₂ Emissions (t/year)	1.57	DFEE	63.25	TFEE	25.04	
Compliance Check	See BREL	% DFEE < TFEE				-152.63
% DPER < TPER	-188.72	DPER	161.05	TPER	55.78	
Assessor Details	Mr. Andrew Taylor				Assessor ID	P741-0001
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	63.0400 (1b)	x 2.4000 (2b)	= 151.2960 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0400		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 151.2960 (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)

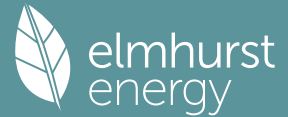
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test	0.0000 / (5) = 0.0000 (8)
Pressure Test Method	No
Measured/design AP50	Blower Door
Infiltration rate	15.0000 (17)
Number of sides sheltered	0.7500 (18)
	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7500 (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	0.9562	0.9375	0.9188	0.8250	0.8062	0.7125	0.7125	0.6938	0.7500	0.8062	0.8438	0.8813 (22b)
Mechanical extract ventilation - decentralised												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)												
Effective ac	1.2062	1.1875	1.1688	1.0750	1.0562	0.9625	0.9625	0.9438	1.0000	1.0562	1.0938	1.1313 (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
Windows (Uw = 1.60)			7.5000	1.5038	11.2782		(27)
Door			1.6600	1.4000	2.3240		(26)
Heatloss Floor 1			63.4000	0.1700	10.7780	110.0000	6974.0000 (28a)
External Wall 1	23.0700	9.1600	13.9100	0.3000	4.1730	150.0000	2086.5000 (29a)

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External Wall 2	3.4000	3.4000	0.3000	1.0200	150.0000	510.0000 (29a)
Total net area of external elements Aum(A, m2)	89.8700					(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	29.5732				(33)
Party Wall 1	12.9600	0.0000	0.0000		180.0000	2332.8000 (32)
Party Ceiling 1	63.4000				20.0000	1268.0000 (32b)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13171.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.9356 (35)
Thermal bridges (Default value 0.200 * total exposed area)		17.9740 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	47.5472 (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	60.2253	59.2891	58.3530	53.6723	52.7361	48.0554	48.0554	47.1192	49.9277	52.7361	54.6084	56.4807 (38)
	107.7725	106.8363	105.9002	101.2195	100.2833	95.6026	95.6026	94.6664	97.4749	100.2833	102.1556	104.0279 (39)
Average = Sum(39)m / 12 =												100.9854

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.7096	1.6947	1.6799	1.6056	1.5908	1.5165	1.5165	1.5017	1.5462	1.5908	1.6205	1.6502 (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												2.0662 (42)
Hot water usage for mixer showers												
	80.9355	79.7192	77.9468	74.5557	72.0531	69.2622	67.6759	69.4349	71.3630	74.3596	77.8236	80.6254 (42a)
Hot water usage for baths												
	26.7746	26.3770	25.8170	24.7846	24.0115	23.1542	22.6912	23.2472	23.8526	24.7699	25.8237	26.6841 (42b)
Hot water usage for other uses												
	37.6731	36.3032	34.9333	33.5633	32.1934	30.8235	30.8235	32.1934	33.5633	34.9333	36.3032	37.6731 (42c)
Average daily hot water use (litres/day)												133.6924 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	145.3833	142.3994	138.6971	132.9036	128.2579	123.2399	121.1905	124.8755	128.7790	134.0628	139.9504	144.9827 (44)
Energy conte	230.2516	202.7749	213.1723	181.9383	172.6599	151.5379	146.5695	154.6220	158.7974	181.9219	199.3851	227.0078 (45)
Energy content (annual)										Total = Sum(45)m =		2220.6385
Distribution loss (46)m = 0.15 x (45)m												
	34.5377	30.4162	31.9758	27.2908	25.8990	22.7307	21.9854	23.1933	23.8196	27.2883	29.9078	34.0512 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	281.2105	248.8023	264.1312	231.2534	223.6188	200.8529	197.5284	205.5809	208.1125	232.8808	248.7001	277.9667 (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												
	281.2105	248.8023	264.1312	231.2534	223.6188	200.8529	197.5284	205.5809	208.1125	232.8808	248.7001	277.9667 (64)

12Total per year (kWh/year) = 2820.6385 (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)
												0.0000 (64a)

Heat gains from water heating, kWh/month	89.2984	78.9295	83.6195	72.8233	70.1491	62.7151	61.4741	64.1515	65.1289	73.2288	78.6243	88.2198 (65)
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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
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	101.2699	112.1202	101.2699	104.6455	101.2699	104.6455	101.2699	101.2699	104.6455	101.2699	104.6455	101.2699 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	180.5436	182.4171	177.6960	167.6453	154.9582	143.0340	135.0680	133.1945	137.9156	147.9663	160.6534	172.5776 (68)
Pumps, fans	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308 (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)	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461 (71)
	120.0247	117.4546	112.3918	101.1434	94.2865	87.1043	82.6264	86.2252	90.4568	98.4258	109.2004	118.5750 (72)
Total internal gains	458.8305	468.9842	448.3500	430.4266	407.5068	388.7762	372.9566	374.6818	387.0102	404.6542	431.4917	449.4148 (73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast	1.6400				11.2829		0.6300		0.7000		0.7700		5.6551 (75)	
Southeast	2.0700				36.7938		0.6300		0.7000		0.7700		23.2765 (77)	
Southwest	3.7900				36.7938		0.6300		0.7000		0.7700		42.6173 (79)	
Solar gains	71.5489	123.7526	174.3130	224.3451	258.9185	260.4037	249.6597	223.3531	191.5590	138.1182	86.0411	61.0096	(83)	
Total gains	530.3794	592.7368	622.6630	654.7717	666.4253	649.1799	622.6162	598.0349	578.5692	542.7724	517.5328	510.4243	(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	33.9483	34.2458	34.5485	36.1462	36.4836	38.2698	38.2698	38.6483	37.5347	36.4836	35.8149	35.1703		
alpha	3.2632	3.2831	3.3032	3.4097	3.4322	3.5513	3.5513	3.5766	3.5023	3.4322	3.3877	3.3447		
util living area	0.9868	0.9800	0.9692	0.9413	0.8837	0.7566	0.6102	0.6451	0.8324	0.9460	0.9789	0.9884	(86)	
MIT	18.7672	19.0016	19.3604	19.9145	20.3851	20.7810	20.9261	20.9095	20.6554	20.0527	19.3752	18.8008	(87)	
Th 2	19.5340	19.5446	19.5553	19.6092	19.6201	19.6751	19.6751	19.6862	19.6530	19.6201	19.5983	19.5767	(88)	
util rest of house	0.9829	0.9739	0.9593	0.9204	0.8370	0.6560	0.4542	0.4948	0.7513	0.9227	0.9716	0.9850	(89)	
MIT 2	17.5739	17.8127	18.1739	18.7505	19.1970	19.5674	19.6548	19.6586	19.4606	18.8977	18.2214	17.6364	(90)	
Living area fraction	fLA = Living area / (4) = 0.5441 (91)													
MIT	18.2232	18.4596	18.8195	19.3838	19.8434	20.2277	20.3465	20.3392	20.1107	19.5261	18.8492	18.2700	(92)	
Temperature adjustment	-0.1500													
adjusted MIT	18.0732	18.3096	18.6695	19.2338	19.6934	20.0777	20.1965	20.1892	19.9607	19.3761	18.6992	18.1200	(93)	
8. Space heating requirement														
Utilisation	0.9774	0.9669	0.9511	0.9133	0.8399	0.6901	0.5201	0.5571	0.7729	0.9173	0.9650	0.9800	(94)	
Useful gains	518.3703	573.1178	592.2206	597.9950	559.7569	448.0102	323.8027	333.1799	447.1931	497.9093	499.4391	500.2098	(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	1484.3664	1432.6301	1288.7515	1045.9841	801.6079	523.6830	343.8362	358.7134	571.2718	880.1011	1184.9219	1448.0648	(97)	
Space heating kWh	718.7011	577.5923	518.2190	322.5522	179.9371	0.0000	0.0000	0.0000	0.0000	284.3506	493.5476	705.2041	(98a)	
Space heating requirement - total per year (kWh/year)													3800.1041	
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	718.7011	577.5923	518.2190	322.5522	179.9371	0.0000	0.0000	0.0000	0.0000	284.3506	493.5476	705.2041	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)													3800.1041	
Space heating per m2	(98c) / (4) =												60.2808 (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 %)													84.0000 (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	718.7011	577.5923	518.2190	322.5522	179.9371	0.0000	0.0000	0.0000	0.0000	284.3506	493.5476	705.2041	(98)	
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)	
Space heating fuel (main heating system)	855.5965	687.6099	616.9274	383.9907	214.2109	0.0000	0.0000	0.0000	0.0000	338.5127	587.5567	839.5287	(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	281.2105	248.8023	264.1312	231.2534	223.6188	200.8529	197.5284	205.5809	208.1125	232.8808	248.7001	277.9667	(64)	
Efficiency of water heater														
(217)m	81.2577	81.0710	80.7294	79.9917	78.7627	75.0000	75.0000	75.0000	75.0000	79.6942	80.7531	75.0000	(216)	
Fuel for water heating, kWh/month	346.0724	306.8941	327.1811	289.0967	283.9145	267.8039	263.3712	274.1078	277.4833	292.2181	307.9759	342.1396	(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	38.6576	34.9166	38.6576	37.4106	38.6576	37.4106	38.6576	38.6576	37.4106	38.6576	37.4106	38.6576	(231)	

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Lighting	24.9154	19.9880	17.9970	13.1854	10.1848	8.3210	9.2909	12.0766	15.6864	20.5814	23.2466	25.6078 (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												4523.9335 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												3578.2587 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEV)Decentralised, Table 4g: in-use factor = 2.5000, SFP = 2.0000)												
mechanical ventilation fans (SFP = 2.0000)												369.1622 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												455.1622 (231)
Electricity for lighting (calculated in Appendix L)												201.0813 (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												8758.4358 (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	4523.9335	0.2100	950.0260 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3578.2587	0.2100	751.4343 (264)
Space and water heating			1701.4604 (265)
Pumps, fans and electric keep-hot	455.1622	0.1387	63.1366 (267)
Energy for lighting	201.0813	0.1443	29.0222 (268)
Total CO2, kg/year			1793.6192 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			28.4500 (273)

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

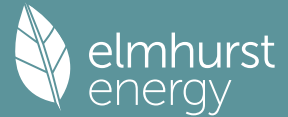
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	4523.9335	1.1300	5112.0449 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3578.2587	1.1300	4043.4323 (278)
Space and water heating			9155.4772 (279)
Pumps, fans and electric keep-hot	455.1622	1.5128	688.5694 (281)
Energy for lighting	201.0813	1.5338	308.4252 (282)
Total Primary energy kWh/year			10152.4719 (286)
Dwelling Primary energy Rate (DPER)			161.0500 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	63.0400 (1b)	x 2.4000 (2b)	= 151.2960 (1b) -

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Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 63.0400 (4)
 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 151.2960 (5)

2. Ventilation rate

	m3 per hour											
Number of open chimneys	0 * 80 =	0.0000	(6a)									
Number of open flues	0 * 20 =	0.0000	(6b)									
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)									
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)									
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)									
Number of blocked chimneys	0 * 20 =	0.0000	(6f)									
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)									
Number of passive vents	0 * 10 =	0.0000	(7b)									
Number of flueless gas fires	0 * 40 =	0.0000	(7c)									
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1322	(8)									
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	5.0000	(17)										
Infiltration rate	0.3822	(18)										
Number of sides sheltered	0	(19)										
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)									
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3822	(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	0.4873	0.4777	0.4682	0.4204	0.4109	0.3631	0.3631	0.3535	0.3822	0.4109	0.4300	0.4491	(22b)
Effective ac	0.6187	0.6141	0.6096	0.5884	0.5844	0.5659	0.5659	0.5625	0.5730	0.5844	0.5924	0.6008	(25)

3. Heat losses and heat loss parameter

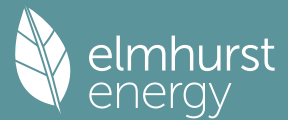
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.6600	1.0000	1.6600			(26)
TER Opening Type (Uw = 1.20)			7.5000	1.1450	8.5878			(27)
Heatloss Floor 1			63.4000	0.1300	8.2420			(28a)
External Wall 1	23.0700	9.1600	13.9100	0.1800	2.5038			(29a)
External Wall 2	3.4000		3.4000	0.1800	0.6120			(29a)
Total net area of external elements Aum(A, m2)			89.8700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.6056			(33)
Party Wall 1			12.9600	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								218.9927 (35)
Thermal bridges (User defined value 0.050 * total exposed area)								4.4935 (36)
Point Thermal bridges								(36a) = 0.0000
Total fabric heat loss								(33) + (36) + (36a) = 26.0991 (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	30.8916	30.6615	30.4358	29.3761	29.1778	28.2548	28.2548	28.0839	28.6103	29.1778	29.5789	29.9982 (38)
Average = Sum(39)m / 12 =	56.9907	56.7605	56.5349	55.4752	55.2769	54.3539	54.3539	54.1829	54.7094	55.2769	55.6780	56.0973 (39)
												55.4742
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9040	0.9004	0.8968	0.8800	0.8769	0.8622	0.8622	0.8595	0.8679	0.8769	0.8832	0.8899 (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												2.0662 (42)
Hot water usage for mixer showers	58.8622	57.9776	56.6886	54.2223	52.4022	50.3725	49.2188	50.4981	51.9004	54.0797	56.5990	58.6367 (42a)
Hot water usage for baths	25.4359	25.0581	24.5262	23.5453	22.8109	21.9965	21.5566	22.0849	22.6600	23.5314	24.5325	25.3499 (42b)
Hot water usage for other uses	35.7895	34.4880	33.1866	31.8852	30.5837	29.2823	29.2823	30.5837	31.8852	33.1866	34.4880	35.7895 (42c)
Average daily hot water use (litres/day)												110.3880 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	120.0876	117.5238	114.4014	109.6528	105.7969	101.6513	100.0578	103.1667	106.4456	110.7977	115.6195	119.7761 (44)
Energy conte	190.1894	167.3523	175.8307	150.1092	142.4229	124.9922	121.0112	127.7419	131.2580	150.3515	164.7212	187.5404 (45)
Energy content (annual)											Total = Sum(45)m =	1833.5208
Distribution loss (46)m = 0.15 x (45)m												

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	28.5284	25.1028	26.3746	22.5164	21.3634	18.7488	18.1517	19.1613	19.6887	22.5527	24.7082	28.1311 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	241.1483	213.3797	226.7896	199.4243	193.3818	174.3072	171.9701	178.7008	180.5731	201.3104	214.0362	238.4993 (62)
WWHRS	-26.9093	-23.7988	-24.9208	-20.6354	-19.2314	-16.4565	-15.4253	-16.4033	-17.0265	-20.0724	-22.7396	-26.4110 (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	214.2389	189.5809	201.8688	178.7889	174.1504	157.8508	156.5448	162.2975	163.5466	181.2380	191.2967	212.0883 (64)
												2183.4905 (64)
12Total per year (kWh/year)												2183 (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)
												0.0000 (64a)
Heat gains from water heating, kWh/month	75.9777	67.1515	71.2034	62.2401	60.0953	53.8887	52.9759	55.2139	55.9721	62.7316	67.0986	75.0969 (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	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.2699	112.1202	101.2699	104.6455	101.2699	104.6455	101.2699	101.2699	104.6455	101.2699	104.6455	101.2699	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.5436	182.4171	177.6960	167.6453	154.9582	143.0340	135.0680	133.1945	137.9156	147.9663	160.6534	172.5776	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	(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)	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	(71)
Water heating gains (Table 5)	102.1206	99.9278	95.7035	86.4446	80.7733	74.8454	71.2042	74.2122	77.7390	84.3167	93.1924	100.9367	(72)
Total internal gains	440.9264	451.4574	431.6617	415.7277	393.9937	376.5172	361.5343	362.6689	374.2924	390.5451	415.4837	431.7764	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W

Northeast			1.6400		11.2829		0.6300		0.7000		0.7700		5.6551 (75)
Southeast			2.0700		36.7938		0.6300		0.7000		0.7700		23.2765 (77)
Southwest			3.7900		36.7938		0.6300		0.7000		0.7700		42.6173 (79)

Solar gains	71.5489	123.7526	174.3130	224.3451	258.9185	260.4037	249.6597	223.3531	191.5590	138.1182	86.0411		61.0096 (83)
Total gains	512.4752	575.2100	605.9747	640.0728	652.9121	636.9209	611.1940	586.0220	565.8514	528.6633	501.5248		492.7860 (84)

7. Mean internal temperature (heating season)

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

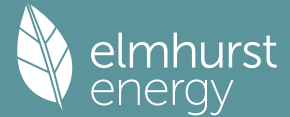
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	67.2882	67.5611	67.8308	69.1265	69.3745	70.5526	70.5526	70.7751	70.0941	69.3745	68.8747	68.3599
alpha	5.4859	5.5041	5.5221	5.6084	5.6250	5.7035	5.7035	5.7183	5.6729	5.6250	5.5916	5.5573
util living area	0.9843	0.9695	0.9429	0.8681	0.7325	0.5382	0.3902	0.4235	0.6432	0.8822	0.9670	0.9868 (86)
MIT	20.1125	20.2929	20.5065	20.7695	20.9285	20.9898	20.9986	20.9978	20.9729	20.7836	20.4242	20.0923 (87)
Th 2	20.1641	20.1672	20.1702	20.1845	20.1872	20.1997	20.1997	20.2021	20.1949	20.1872	20.1818	20.1761 (88)
util rest of house	0.9803	0.9621	0.9291	0.8391	0.6831	0.4741	0.3198	0.3510	0.5769	0.8501	0.9577	0.9835 (89)
MIT 2	19.1414	19.3694	19.6353	19.9570	20.1279	20.1936	20.1992	20.2012	20.1769	19.9810	19.5476	19.1252 (90)
Living area fraction									fLA = Living area / (4) =			0.5441 (91)
MIT	19.6698	19.8718	20.1093	20.3991	20.5635	20.6268	20.6342	20.6346	20.6100	20.4177	20.0245	19.6514 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6698	19.8718	20.1093	20.3991	20.5635	20.6268	20.6342	20.6346	20.6100	20.4177	20.0245	19.6514 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9774	0.9591	0.9280	0.8472	0.7066	0.5086	0.3581	0.3904	0.6117	0.8599	0.9556	0.9808 (94)

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Useful gains	500.8825	551.6580	562.3473	542.2953	461.3637	323.9525	218.8661	228.7892	346.1543	454.6213	479.2816	483.3343 (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	875.9351	849.8098	769.4002	637.9126	489.9466	327.5813	219.2728	229.4454	356.1581	542.6900	719.6126	866.7839 (97)
Space heating kWh	279.0391	200.3580	154.0474	68.8444	21.2656	0.0000	0.0000	0.0000	0.0000	65.5231	173.0383	285.2865 (98a)
Space heating requirement - total per year (kWh/year)												1247.4024
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	279.0391	200.3580	154.0474	68.8444	21.2656	0.0000	0.0000	0.0000	0.0000	65.5231	173.0383	285.2865 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1247.4024
Space heating per m2										(98c) / (4) =		19.7875 (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	279.0391	200.3580	154.0474	68.8444	21.2656	0.0000	0.0000	0.0000	0.0000	65.5231	173.0383	285.2865 (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)	301.9904	216.8377	166.7179	74.5070	23.0148	0.0000	0.0000	0.0000	0.0000	70.9125	187.2709	308.7516 (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	214.2389	189.5809	201.8688	178.7889	174.1504	157.8508	156.5448	162.2975	163.5466	181.2380	191.2967	212.0883 (64)	
Efficiency of water heater												80.3000 (216)	
(217)m	84.9486	84.5001	83.8091	82.5193	81.1543	80.3000	80.3000	80.3000	80.3000	82.4171	84.1671	85.0174 (217)	
Fuel for water heating, kWh/month	252.1982	224.3557	240.8674	216.6632	214.5916	196.5763	194.9499	202.1140	203.6695	219.9035	227.2821	249.4645 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)	
Lighting	21.0419	16.8806	15.1991	11.1355	8.6014	7.0274	7.8465	10.1991	13.2477	17.3817	19.6325	21.6267 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.8041	-42.1716	-60.8385	-68.6727	-74.2973	-69.4665	-68.6500	-64.7215	-57.7749	-48.3973	-32.8378	-25.7528 (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	-16.3474	-34.4549	-68.5949	-103.1753	-136.5508	-137.2206	-135.5646	-114.6834	-83.9574	-49.2729	-21.8291	-12.9185 (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												1350.0027 (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												2642.6359 (219)	
Space cooling fuel												0.0000 (221)	

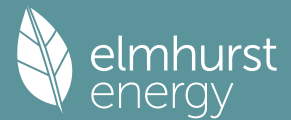
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000 (231)	
Electricity for lighting (calculated in Appendix L)												169.8200 (232)	

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1557.9550 (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												2690.5036 (238)	

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

	Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	1350.0027	0.2100	283.5006 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2642.6359	0.2100	554.9535 (264)
Space and water heating			838.4541 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	169.8200	0.1443	24.5103 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-643.3852	0.1345	-86.5330
PV Unit electricity exported	-914.5697	0.1259	-115.1074
Total			-201.6404 (269)
Total CO2, kg/year			673.2532 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6800 (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	1350.0027	1.1300	1525.5030 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2642.6359	1.1300	2986.1786 (278)
Space and water heating			4511.6816 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	169.8200	1.5338	260.4756 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-643.3852	1.4971	-963.1933
PV Unit electricity exported	-914.5697	0.4620	-422.5223
Total			-1385.7156 (283)
Total Primary energy kWh/year			3516.5423 (286)
Target Primary Energy Rate (TPER)			55.7800 (287)

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Property Reference	Unit 2	Issued on Date	07/08/2023
Assessment Reference	Be Lean	Prop Type Ref	
Property	155, Tittenham Lane , London, N8 9BT		
SAP Rating	73 C	DER	32.62
Environmental	78 C	TER	13.34
CO ₂ Emissions (t/year)	1.34	% DER < TER	-144.53
Compliance Check	See BREL	DFEE	72.25
% DPER < TPER	-162.33	TFEE	35.74
		% DFEE < TFEE	-102.16
		TPER	70.05
Assessor Details	Mr. Andrew Taylor	Assessor ID	P741-0001
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	46.6600 (1b)	x 2.4000 (2b)	= 111.9840 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	46.6600		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 111.9840 (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) =	Air changes per hour
Pressure test	0.0000 / (5) = 0.0000 (8)
Pressure Test Method	Yes
Measured/design AP50	Blower Door
Infiltration rate	8.0000 (17)
Number of sides sheltered	0.4000 (18)
	0 (19)

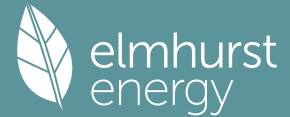
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4000 (21)

	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	0.5100	0.5000	0.4900	0.4400	0.4300	0.3800	0.3800	0.3700	0.4000	0.4300	0.4500	0.4700 (22b)
Mechanical extract ventilation - decentralised												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)												
Effective ac	0.7600	0.7500	0.7400	0.6900	0.6800	0.6300	0.6300	0.6200	0.6500	0.6800	0.7000	0.7200 (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
Windows (Uw = 1.60)			12.2400	1.5038	18.4060		(27)
Door			1.8900	1.4000	2.6460		(26)
Heatloss Floor 1			46.6600	0.1700	7.9322	110.0000	5132.6000 (28a)
External Wall	46.3200	14.1300	32.1900	0.3000	9.6570	150.0000	4828.5000 (29a)

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External Wall 2	11.0400	11.0400	0.3000	3.3120	150.0000	1656.0000 (29a)
Total net area of external elements Aum(A, m2)		104.0200				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		41.9532		(33)
Party Wall 1		13.4400	0.0000	0.0000	70.0000	940.8000 (32)
Party Ceiling 1		46.6600			20.0000	933.2000 (32b)

Heat capacity Cm = Sum(A x k)		(28)...(30) + (32) + (32a)...(32e) =				13491.1000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						289.1363 (35)
Thermal bridges (Default value 0.200 * total exposed area)						20.8040 (36)
Point Thermal bridges					(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =				62.7572 (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	28.0856	27.7160	27.3465	25.4988	25.1292	23.2815	23.2815	22.9119	24.0206	25.1292	25.8683	26.6074	(38)
Average = Sum(39)m / 12 =	90.8428	90.4733	90.1037	88.2560	87.8864	86.0387	86.0387	85.6691	86.7778	87.8864	88.6255	89.3646	(39)
												88.1636	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.9469	1.9390	1.9311	1.8915	1.8835	1.8439	1.8439	1.8360	1.8598	1.8835	1.8994	1.9152	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

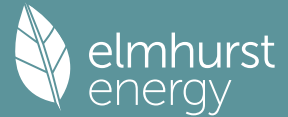
Assumed occupancy													1.5924 (42)
Hot water usage for mixer showers													
	89.8414	88.4913	86.5239	82.7596	79.9816	76.8836	75.1228	77.0753	79.2156	82.5419	86.3871	89.4972	(42a)
Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
	30.9380	29.8129	28.6879	27.5629	26.4379	25.3129	25.3129	26.4379	27.5629	28.6879	29.8129	30.9380	(42c)
Average daily hot water use (litres/day)													110.9562 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	120.7794	118.3042	115.2118	110.3225	106.4195	102.1965	100.4356	103.5132	106.7785	111.2298	116.2000	120.4352	(44)
Energy conte	191.2850	168.4636	177.0762	151.0259	143.2611	125.6625	121.4682	128.1709	131.6686	150.9378	165.5482	188.5724	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 1843.1406
	28.6928	25.2695	26.5614	22.6539	21.4892	18.8494	18.2202	19.2256	19.7503	22.6407	24.8322	28.2859	(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													
	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	242.2439	214.4910	228.0351	200.3410	194.2200	174.9776	172.4271	179.1298	180.9837	201.8967	214.8633	239.5313	(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													
	242.2439	214.4910	228.0351	200.3410	194.2200	174.9776	172.4271	179.1298	180.9837	201.8967	214.8633	239.5313	(64)
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 2443.1406 (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)
													0.0000 (64a)
Heat gains from water heating, kWh/month													
	76.3420	67.5210	71.6176	62.5449	60.3740	54.1116	53.1279	55.3566	56.1086	62.9265	67.3735	75.4400	(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	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	69.8921	77.3805	69.8921	72.2218	69.8921	72.2218	69.8921	69.8921	72.2218	69.8921	72.2218	69.8921	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	138.5689	140.0068	136.3833	128.6693	118.9318	109.7799	103.6659	102.2280	105.8515	113.5654	123.3030	132.4549	(68)
Pumps, fans	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	(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)
	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	(71)
Water heating gains (Table 5)													
	102.6102	100.4777	96.2602	86.8679	81.1479	75.1549	71.4085	74.4040	77.9286	84.5787	93.5744	101.3979	(72)
Total internal gains													
	360.9575	367.7513	352.4218	337.6453	319.8581	304.0430	291.8527	293.4103	302.8881	317.9225	338.9854	353.6311	(73)

6. Solar gains

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[Jan]			Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast			5.0000	36.7938	0.6300	0.7000	0.7700	56.2234 (77)
Southwest			6.3000	36.7938	0.6300	0.7000	0.7700	70.8414 (79)
Northwest			0.9400	11.2829	0.6300	0.7000	0.7700	3.2413 (81)

Solar gains	130.3061	223.0362	308.0276	386.4545	437.2364	435.9990	419.5487	381.3689	335.1421	247.2736	156.2728	111.3880 (83)
Total gains	491.2636	590.7875	660.4494	724.0998	757.0944	740.0419	711.4014	674.7792	638.0303	565.1961	495.2582	465.0191 (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	41.2529	41.4214	41.5913	42.4620	42.6406	43.5563	43.5563	43.7442	43.1853	42.6406	42.2850	41.9353
alpha	3.7502	3.7614	3.7728	3.8308	3.8427	3.9038	3.9038	3.9163	3.8790	3.8427	3.8190	3.7957
util living area	0.9901	0.9798	0.9608	0.9142	0.8227	0.6656	0.5099	0.5522	0.7691	0.9333	0.9813	0.9919 (86)
MIT	19.1339	19.4089	19.7806	20.2591	20.6447	20.8933	20.9709	20.9605	20.8018	20.2938	19.6403	19.1083 (87)
Th 2	19.3690	19.3743	19.3797	19.4067	19.4121	19.4394	19.4394	19.4449	19.4284	19.4121	19.4013	19.3904 (88)
util rest of house	0.9862	0.9719	0.9449	0.8782	0.7475	0.5349	0.3399	0.3808	0.6525	0.8971	0.9726	0.9887 (89)
MIT 2	17.7676	18.0414	18.4062	18.8748	19.2077	19.4017	19.4348	19.4377	19.3439	18.9234	18.2919	17.7576 (90)
Living area fraction									fLA = Living area / (4) =			0.5394 (91)
MIT	18.5047	18.7791	19.1476	19.6216	19.9829	20.2063	20.2635	20.2591	20.1304	19.6626	19.0193	18.4862 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5047	18.7791	19.1476	19.6216	19.9829	20.2063	20.2635	20.2591	20.1304	19.6626	19.0193	18.4862 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9833	0.9681	0.9420	0.8839	0.7776	0.6031	0.4326	0.4742	0.7099	0.9041	0.9698	0.9861 (94)
Useful gains	483.0450	571.9171	622.1544	640.0236	588.7528	446.3561	307.7456	319.9757	452.9364	510.9756	480.2914	458.5720 (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	1290.3906	1255.6861	1139.5960	946.2430	727.9508	482.3598	315.1996	330.6097	523.3029	796.4835	1056.3518	1276.6828 (97)
Space heating kwh	600.6652	459.4928	384.9765	220.4780	103.5633	0.0000	0.0000	0.0000	0.0000	212.4179	414.7635	608.6744 (98a)
Space heating requirement - total per year (kWh/year)												3005.0315
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	600.6652	459.4928	384.9765	220.4780	103.5633	0.0000	0.0000	0.0000	0.0000	212.4179	414.7635	608.6744 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3005.0315
Space heating per m2										(98c) / (4) =		64.4027 (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 %)												79.0000 (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	600.6652	459.4928	384.9765	220.4780	103.5633	0.0000	0.0000	0.0000	0.0000	212.4179	414.7635	608.6744 (98)
Space heating efficiency (main heating system 1)	79.0000	79.0000	79.0000	79.0000	79.0000	0.0000	0.0000	0.0000	0.0000	79.0000	79.0000	79.0000 (210)
Space heating fuel (main heating system)	760.3356	581.6364	487.3121	279.0860	131.0928	0.0000	0.0000	0.0000	0.0000	268.8834	525.0171	770.4739 (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	242.2439	214.4910	228.0351	200.3410	194.2200	174.9776	172.4271	179.1298	180.9837	201.8967	214.8633	239.5313 (64)
Efficiency of water heater (217)m	81.1997	80.9101	80.4106	79.4605	77.9028	75.0000	75.0000	75.0000	75.0000	79.3594	80.6955	75.0000 (216)
Fuel for water heating, kWh/month	298.3311	265.0980	283.5886	252.1265	249.3106	233.3035	229.9028	238.8398	241.3116	254.4082	266.2643	294.8196 (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	30.5109	27.5582	30.5109	29.5267	30.5109	29.5267	30.5109	30.5109	29.5267	30.5109	29.5267	30.5109 (231)

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Lighting	17.8856	14.3485	12.9192	9.4652	7.3112	5.9733	6.6695	8.6693	11.2605	14.7744	16.6877	18.3827 (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												3803.8374 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												3107.3045 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEV)Decentralised, Table 4g: in-use factor = 2.5000, SFP = 2.0000)												
mechanical ventilation fans (SFP = 2.0000)												273.2410 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												359.2410 (231)
Electricity for lighting (calculated in Appendix L)												144.3470 (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												7414.7299 (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	3803.8374	0.2100	798.8058 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3107.3045	0.2100	652.5339 (264)
Space and water heating			1451.3398 (265)
Pumps, fans and electric keep-hot	359.2410	0.1387	49.8312 (267)
Energy for lighting	144.3470	0.1443	20.8337 (268)
Total CO2, kg/year			1522.0047 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			32.6200 (273)

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

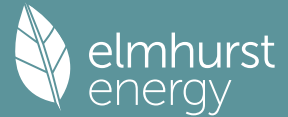
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3803.8374	1.1300	4298.3362 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3107.3045	1.1300	3511.2541 (278)
Space and water heating			7809.5903 (279)
Pumps, fans and electric keep-hot	359.2410	1.5128	543.4597 (281)
Energy for lighting	144.3470	1.5338	221.4043 (282)
Total Primary energy kWh/year			8574.4543 (286)
Dwelling Primary energy Rate (DPER)			183.7600 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	46.6600 (1b)	x 2.4000 (2b)	= 111.9840 (1b) -

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Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 46.6600 (4)
 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 111.9840 (5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour	
Pressure test	20.0000 / (5) =	0.1786 (8)
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	
Infiltration rate		5.0000 (17)
Number of sides sheltered		0.4286 (18)
		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.4286 (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	0.5465	0.5357	0.5250	0.4715	0.4607	0.4072	0.4072	0.3965	0.4286	0.4607	0.4822	0.5036	(22b)
Effective ac	0.6493	0.6435	0.6378	0.6111	0.6061	0.5829	0.5829	0.5786	0.5918	0.6061	0.6162	0.6268	(25)

3. Heat losses and heat loss parameter

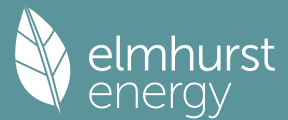
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			9.7700	1.1450	11.1870			(27)
Heatloss Floor 1			46.6600	0.1300	6.0658			(28a)
External Wall	46.3200	11.6600	34.6600	0.1800	6.2388			(29a)
External Wall 2	11.0400		11.0400	0.1800	1.9872			(29a)
Total net area of external elements Aum(A, m2)			104.0200					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	27.3688		(33)
Party Wall 1			13.4400	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								299.1363 (35)
Thermal bridges (User defined value 0.050 * total exposed area)								5.2010 (36)
Point Thermal bridges								(36a) = 0.0000
Total fabric heat loss						(33) + (36) + (36a) =		32.5698 (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	23.9951	23.7808	23.5708	22.5843	22.3998	21.5406	21.5406	21.3815	21.8716	22.3998	22.7732	23.1635	(38)
Average = Sum(39)m / 12 =	56.5649	56.3506	56.1406	55.1542	54.9696	54.1105	54.1105	53.9513	54.4414	54.9696	55.3430	55.7333	(39)
												55.1533	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2123	1.2077	1.2032	1.1820	1.1781	1.1597	1.1597	1.1563	1.1668	1.1781	1.1861	1.1945	(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													1.5924 (42)
Hot water usage for mixer showers													
	65.3392	64.3573	62.9265	60.1888	58.1684	55.9154	54.6347	56.0548	57.6114	60.0305	62.8270	65.0889	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	30.9380	29.8129	28.6879	27.5629	26.4379	25.3129	25.3129	26.4379	27.5629	28.6879	29.8129	30.9380	(42c)
Average daily hot water use (litres/day)													88.3660 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	96.2772	94.1702	91.6144	87.7517	84.6063	81.2282	79.9476	82.4926	85.1743	88.7184	92.6399	96.0268	(44)
Energy conte	152.4795	134.0972	140.8079	120.1277	113.8964	99.8796	96.6897	102.1431	105.0284	120.3900	131.9825	150.3548	(45)
Energy content (annual)													Total = Sum(45)m = 1467.8768
Distribution loss (46)m = 0.15 x (45)m													

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	22.8719	20.1146	21.1212	18.0191	17.0845	14.9819	14.5035	15.3215	15.7543	18.0585	19.7974	22.5532 (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	49.0618	43.3441	46.6857	43.2748	43.1145	40.0578	40.7404	42.0373	42.0038	45.2099	45.6854	48.9342 (61)
Total heat required for water heating calculated for each month												
	201.5413	177.4413	187.4936	163.4025	157.0108	139.9374	137.4301	144.1805	147.0321	165.5999	177.6679	199.2890 (62)
WWHRS	-29.8704	-26.4176	-27.6630	-22.9060	-21.3476	-18.2673	-17.1227	-18.2083	-18.9001	-22.2811	-25.2418	-29.3172 (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												
	171.6709	151.0237	159.8306	140.4964	135.6632	121.6701	120.3074	125.9722	128.1321	143.3189	152.4262	169.9718 (64)
												1720.4835 (64)
12Total per year (kWh/year)												1720 (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)
												0.0000 (64a)
Heat gains from water heating, kWh/month												
	62.9649	55.4233	58.4900	50.7611	48.6492	43.2244	42.3344	44.4719	45.4229	51.3322	55.3055	62.2265 (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
	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209	79.6209 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	70.0984	77.6089	70.0984	72.4350	70.0984	72.4350	70.0984	70.0984	72.4350	70.0984	72.4350	70.0984 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	138.5689	140.0068	136.3833	128.6693	118.9318	109.7799	103.6659	102.2280	105.8515	113.5654	123.3030	132.4549 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621	30.9621 (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)												
	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967	-63.6967 (71)
Water heating gains (Table 5)												
	84.6302	82.4752	78.6156	70.5016	65.3887	60.0339	56.9011	59.7741	63.0873	68.9948	76.8132	83.6378 (72)
Total internal gains												
	343.1838	349.9772	334.9836	321.4922	304.3051	289.1351	277.5517	278.9867	288.2601	302.5449	322.4375	336.0773 (73)

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				

Southeast			3.9900	36.7938	0.6300	0.7000	0.7700	44.8662 (77)				
Southwest			5.0300	36.7938	0.6300	0.7000	0.7700	56.5607 (79)				
Northwest			0.7500	11.2829	0.6300	0.7000	0.7700	2.5862 (81)				

Solar gains	104.0131	178.0318	245.8726	308.4726	349.0058	348.0175	334.8870	304.4126	267.5153	197.3783	124.7402	88.9123 (83)
Total gains	447.1969	528.0090	580.8562	629.9648	653.3109	637.1526	612.4387	583.3994	555.7754	499.9233	447.1777	424.9897 (84)

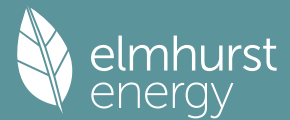
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	68.5432	68.8038	69.0612	70.2964	70.5324	71.6523	71.6523	71.8636	71.2168	70.5324	70.0566	69.5659
util living area	5.5695	5.5869	5.6041	5.6864	5.7022	5.7768	5.7768	5.7909	5.7478	5.7022	5.6704	5.6377
	0.9918	0.9791	0.9516	0.8738	0.7304	0.5361	0.3877	0.4237	0.6511	0.9015	0.9801	0.9936 (86)
MIT	20.0132	20.2310	20.4847	20.7687	20.9326	20.9906	20.9988	20.9980	20.9726	20.7604	20.3456	19.9850 (87)
Th 2	19.9102	19.9139	19.9175	19.9344	19.9376	19.9524	19.9524	19.9551	19.9467	19.9376	19.9311	19.9244 (88)
util rest of house												
	0.9887	0.9717	0.9350	0.8354	0.6643	0.4519	0.2960	0.3284	0.5625	0.8618	0.9718	0.9912 (89)
MIT 2	18.7963	19.0720	19.3856	19.7254	19.8898	19.9481	19.9521	19.9546	19.9323	19.7281	19.2321	18.7713 (90)
Living area fraction												
MIT	19.4528	19.6972	19.9785	20.2882	20.4523	20.5105	20.5167	20.5174	20.4935	20.2850	19.8328	19.4260 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4528	19.6972	19.9785	20.2882	20.4523	20.5105	20.5167	20.5174	20.4935	20.2850	19.8328	19.4260 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9871	0.9700	0.9361	0.8492	0.6975	0.4972	0.3456	0.3799	0.6097	0.8762	0.9709	0.9898 (94)

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Useful gains	441.4076	512.1475	543.7156	534.9563	455.6851	316.8187	211.6332	221.6282	338.8458	438.0272	434.1535	420.6452 (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	857.1138	833.8297	756.6922	628.1070	481.1128	319.8181	211.9350	222.1420	348.0705	532.3794	704.6685	848.5939 (97)
Space heating kwh	309.2855	216.1704	158.4546	67.0685	18.9182	0.0000	0.0000	0.0000	0.0000	70.1981	194.7708	318.3939 (98a)
Space heating requirement - total per year (kwh/year)												1353.2599
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	309.2855	216.1704	158.4546	67.0685	18.9182	0.0000	0.0000	0.0000	0.0000	70.1981	194.7708	318.3939 (98c)
Space heating requirement after solar contribution - total per year (kwh/year)												1353.2599
Space heating per m2										(98c) / (4) =		29.0026 (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	309.2855	216.1704	158.4546	67.0685	18.9182	0.0000	0.0000	0.0000	0.0000	70.1981	194.7708	318.3939 (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)	334.7245	233.9507	171.4877	72.5849	20.4743	0.0000	0.0000	0.0000	0.0000	75.9719	210.7909	344.5821 (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	171.6709	151.0237	159.8306	140.4964	135.6632	121.6701	120.3074	125.9722	128.1321	143.3189	152.4262	169.9718 (64)
Efficiency of water heater	85.6267	85.1493	84.3629	82.8910	81.2621	80.3000	80.3000	80.3000	80.3000	82.9378	84.9078	80.3000 (216)
Fuel for water heating, kWh/month	200.4876	177.3634	189.4560	169.4954	166.9453	151.5194	149.8225	156.8770	159.5667	172.8028	179.5197	85.7054 (217)
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	14.5651	11.6846	10.5207	7.7079	5.9538	4.8643	5.4313	7.0598	9.1700	12.0315	13.5895	14.9699 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-22.3110	-31.7090	-45.9699	-52.1868	-56.7556	-53.2126	-52.6116	-49.4575	-43.9236	-36.5376	-24.6397	-19.2640 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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)	-11.8487	-25.0072	-49.8322	-75.0091	-99.3068	-99.7699	-98.5409	-83.3318	-60.9818	-35.7546	-15.8228	-9.3591 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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												1464.5670 (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												2072.1769 (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)												117.5484 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1153.1437 (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												2587.1485 (238)

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

	Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	1464.5670	0.2100	307.5591 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2072.1769	0.2100	435.1571 (264)
Space and water heating			742.7162 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	117.5484	0.1443	16.9659 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-488.5790	0.1344	-65.6511
PV Unit electricity exported	-664.5647	0.1258	-83.6324
Total			-149.2835 (269)
Total CO2, kg/year			622.3278 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.3400 (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	1464.5670	1.1300	1654.9607 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2072.1769	1.1300	2341.5598 (278)
Space and water heating			3996.5205 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	117.5484	1.5338	180.2996 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-488.5790	1.4966	-731.2081
PV Unit electricity exported	-664.5647	0.4619	-306.9880
Total			-1038.1961 (283)
Total Primary energy kWh/year			3268.7248 (286)
Target Primary Energy Rate (TPER)			70.0500 (287)

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Property Reference	Unit 3			Issued on Date	07/08/2023
Assessment Reference	Be Lean	Prop Type Ref			
Property	115, Tottenham Lane, London, N8 9BT				
SAP Rating	75 C	DER	24.62	TER	11.94
Environmental	81 B	% DER < TER			-106.20
CO ₂ Emissions (t/year)	1.38	DFEE	51.86	TFEE	30.87
Compliance Check	See BREL	% DFEE < TFEE			-68.01
% DPER < TPER	-125.58	DPER	141.04	TPER	62.52
Assessor Details	Mr. Andrew Taylor			Assessor ID	P741-0001
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	63.0400 (1b)	x 2.7000 (2b)	= 170.2080 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0400		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 170.2080 (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) =	Air changes per hour
Pressure test	0.0000 / (5) = 0.0000 (8)
Pressure Test Method	Yes
Measured/design AP50	Blower Door
Infiltration rate	8.0000 (17)
Number of sides sheltered	0.4000 (18)
	0 (19)

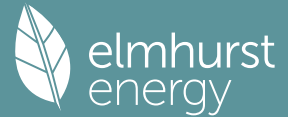
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4000 (21)

	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	0.5100	0.5000	0.4900	0.4400	0.4300	0.3800	0.3800	0.3700	0.4000	0.4300	0.4500	0.4700 (22b)
Mechanical extract ventilation - decentralised												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)												
Effective ac	0.7600	0.7500	0.7400	0.6900	0.6800	0.6300	0.6300	0.6200	0.6500	0.6800	0.7000	0.7200 (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
Door			1.6600	1.4000	2.3240		(26)
Windows (U _w = 1.60)			8.2100	1.5038	12.3459		(27)
External Wall 1	30.0200	9.8700	20.1500	0.3000	6.0450	150.0000	3022.5000 (29a)
External Wall 2	8.6400		8.6400	0.0000	0.0000	150.0000	1296.0000 (29a)

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External Roof	63.0400	63.0400	0.1400	8.8256	9.0000	567.3600 (30)
Total net area of external elements Aum(A, m2)		93.0600				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =	29.5405			(33)
Party Wall 1		21.6500	0.0000	0.0000	70.0000	1515.5000 (32)
Party Floor 1		63.0400			30.0000	1891.2000 (32d)
Party Ceiling 1		63.0400			20.0000	1260.8000 (32b)

Heat capacity Cm = Sum(A x k)		(28)...(30) + (32) + (32a)...(32e) =				9553.3600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						151.5444 (35)
Thermal bridges (Default value 0.200 * total exposed area)						18.6120 (36)
Point Thermal bridges					(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =				48.1525 (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	42.6882	42.1265	41.5648	38.7564	38.1947	35.3862	35.3862	34.8246	36.5096	38.1947	39.3180	40.4414 (38)	
Average = Sum(39)m / 12 =	90.8406	90.2789	89.7173	86.9088	86.3471	83.5387	83.5387	82.9770	84.6621	86.3471	87.4705	88.5939 (39)	86.7684
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.4410	1.4321	1.4232	1.3786	1.3697	1.3252	1.3252	1.3163	1.3430	1.3697	1.3875	1.4054 (40)	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

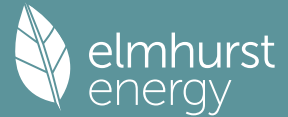
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0662 (42)
Hot water usage for mixer showers													
Hot water usage for baths	78.8907	77.6829	75.9029	73.1647	70.7113	67.2790	64.5643	67.7380	69.3342	72.7337	76.2740	78.8196 (42a)	
Hot water usage for other uses	26.1778	25.7826	25.2204	24.3785	23.6198	22.5753	21.7829	22.7519	23.2604	24.2953	25.3713	26.1570 (42b)	
Average daily hot water use (litres/day)	37.6731	36.3032	34.9333	33.5633	32.1934	30.8235	30.8235	32.1934	33.5633	34.9333	36.3032	37.6731 (42c)	131.2524 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	142.7416	139.7687	136.0566	131.1065	126.5245	120.6778	117.1707	122.6833	126.1580	131.9623	137.9485	142.6497 (44)	
Energy content (annual)	210.1403	184.9422	194.4221	171.2579	163.0396	139.5599	129.4771	144.4005	146.3369	170.0468	186.4420	209.4915 (45)	
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 2049.5569
Water storage loss:	31.5210	27.7413	29.1633	25.6887	24.4559	20.9340	19.4216	21.6601	21.9505	25.5070	27.9663	31.4237 (46)	
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	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)	
Total heat required for water heating calculated for each month													
WWHRS	261.0992	230.9696	245.3810	220.5730	213.9985	188.8750	180.4360	195.3594	195.6520	221.0057	235.7571	260.4504 (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	261.0992	230.9696	245.3810	220.5730	213.9985	188.8750	180.4360	195.3594	195.6520	221.0057	235.7571	260.4504 (64)	
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 2649.5569 (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)	2650 (64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	82.6114	73.0001	77.3851	69.2720	66.9504	58.7324	55.7909	60.7529	60.9858	69.2803	74.3207	82.3957 (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	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077 (66)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	99.2595	109.8945	99.2595	102.5682	99.2595	102.5682	99.2595	99.2595	102.5682	99.2595	102.5682	99.2595 (67)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	180.5436	182.4171	177.6960	167.6453	154.9582	143.0340	135.0680	133.1945	137.9156	147.9663	160.6534	172.5776 (68)	
Pumps, fans	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308 (69)	
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000 (70)	
Water heating gains (Table 5)	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461 (71)	
Total internal gains	111.0368	108.6312	104.0122	96.2111	89.9871	81.5728	74.9877	81.6571	84.7025	93.1187	103.2232	110.7469 (72)	
	447.8323	457.9351	437.9600	423.4170	401.1971	381.1673	363.3075	368.1034	379.1786	397.3368	423.4372	439.5763 (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	

Northeast			4.4200		11.2829		0.6300		0.7000		0.7700		15.2411	(75)
Southwest			3.7900		36.7938		0.6300		0.7000		0.7700		42.6173	(79)

Solar gains	57.8584	103.6168	155.2198	214.8639	261.2380	268.3980	254.9985	219.0178	175.6567	118.1442	70.2230	48.9182	(83)	
Total gains	505.6907	561.5518	593.1799	638.2808	662.4351	649.5653	618.3060	587.1213	554.8353	515.4810	493.6601	488.4945	(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	29.2128	29.3946	29.5786	30.5344	30.7331	31.7662	31.7662	31.9813	31.3447	30.7331	30.3384	29.9537
alpha	2.9475	2.9596	2.9719	3.0356	3.0489	3.1177	3.1177	3.1321	3.0896	3.0489	3.0226	2.9969
util living area	0.9735	0.9624	0.9448	0.9004	0.8201	0.6792	0.5405	0.5791	0.7746	0.9123	0.9600	0.9759 (86)
MIT	18.6505	18.9020	19.2949	19.8896	20.3938	20.7794	20.9212	20.9014	20.6373	20.0019	19.2763	18.6600 (87)
Th 2	19.7320	19.7388	19.7456	19.7798	19.7866	19.8212	19.8212	19.8281	19.8073	19.7866	19.7729	19.7592 (88)
util rest of house	0.9678	0.9542	0.9322	0.8761	0.7725	0.5924	0.4162	0.4573	0.7010	0.8860	0.9500	0.9707 (89)
MIT 2	17.6400	17.8919	18.2824	18.8801	19.3513	19.7000	19.7935	19.7904	19.5859	19.0013	18.2871	17.6677 (90)
Living area fraction									fLA = Living area / (4) =			0.4673 (91)
MIT	18.1122	18.3639	18.7556	19.3519	19.8385	20.2044	20.3205	20.3096	20.0772	19.4689	18.7494	18.1314 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.9622	18.2139	18.6056	19.2019	19.6885	20.0544	20.1705	20.1596	19.9272	19.3189	18.5994	17.9814 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9567	0.9411	0.9173	0.8620	0.7680	0.6112	0.4553	0.4943	0.7095	0.8733	0.9372	0.9605 (94)
Useful gains	483.8106	528.4640	544.1298	550.2041	508.7724	397.0016	281.5365	290.1880	393.6348	450.1750	462.6456	469.1764 (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	1241.0855	1201.9669	1086.0771	895.3223	689.7852	455.6547	298.2746	311.9579	493.3451	752.8518	1005.8551	1220.9502 (97)
Space heating kwh	563.4125	452.5940	403.2088	248.4851	134.6735	0.0000	0.0000	0.0000	0.0000	225.1915	391.1108	559.3197 (98a)
Space heating requirement - total per year (kWh/year)												2977.9959
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	563.4125	452.5940	403.2088	248.4851	134.6735	0.0000	0.0000	0.0000	0.0000	225.1915	391.1108	559.3197 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2977.9959
Space heating per m2										(98c) / (4) =		47.2398 (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 %)												84.0000 (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	563.4125	452.5940	403.2088	248.4851	134.6735	0.0000	0.0000	0.0000	0.0000	225.1915	391.1108	559.3197 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	670.7292	538.8024	480.0104	295.8156	160.3256	0.0000	0.0000	0.0000	0.0000	268.0852	465.6081	665.8567 (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	261.0992	230.9696	245.3810	220.5730	213.9985	188.8750	180.4360	195.3594	195.6520	221.0057	235.7571	260.4504 (64)
Efficiency of water heater (217)m	80.9248	80.7268	80.3520	79.5131	78.2378	75.0000	75.0000	75.0000	75.0000	79.2874	80.3727	75.0000 (216)
Fuel for water heating, kWh/month	322.6442	286.1128	305.3824	277.4046	273.5234	251.8333	240.5814	260.4792	260.8693	278.7400	293.3297	321.8812 (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	42.5768	38.4565	42.5768	41.2034	42.5768	41.2034	42.5768	42.5768	41.2034	42.5768	41.2034	42.5768 (231)

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Lighting	25.4558	20.4216	18.3874	13.4714	10.4057	8.5015	9.4924	12.3386	16.0266	21.0278	23.7509	26.1633 (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												3545.2333 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												3372.7813 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEV)Decentralised, Table 4g: in-use factor = 2.5000, SFP = 2.0000)												
mechanical ventilation fans (SFP = 2.0000)												415.3075 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												501.3075 (231)
Electricity for lighting (calculated in Appendix L)												205.4431 (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												7624.7652 (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	3545.2333	0.2100	744.4990 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3372.7813	0.2100	708.2841 (264)
Space and water heating			1452.7830 (265)
Pumps, fans and electric keep-hot	501.3075	0.1387	69.5375 (267)
Energy for lighting	205.4431	0.1443	29.6518 (268)
Total CO2, kg/year			1551.9724 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			24.6200 (273)

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

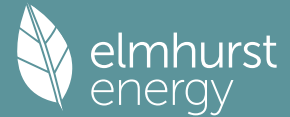
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3545.2333	1.1300	4006.1136 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3372.7813	1.1300	3811.2428 (278)
Space and water heating			7817.3564 (279)
Pumps, fans and electric keep-hot	501.3075	1.5128	758.3780 (281)
Energy for lighting	205.4431	1.5338	315.1156 (282)
Total Primary energy kWh/year			8890.8500 (286)
Dwelling Primary energy Rate (DPER)			141.0400 (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	63.0400 (1b)	x 2.7000 (2b)	= 170.2080 (1b) -

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Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 63.0400 (4)
 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 170.2080 (5)

2. Ventilation rate

	m3 per hour											
Number of open chimneys	0 * 80 =	0.0000	(6a)									
Number of open flues	0 * 20 =	0.0000	(6b)									
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)									
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)									
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)									
Number of blocked chimneys	0 * 20 =	0.0000	(6f)									
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)									
Number of passive vents	0 * 10 =	0.0000	(7b)									
Number of flueless gas fires	0 * 40 =	0.0000	(7c)									
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1175	(8)									
Pressure test	Yes											
Pressure Test Method	Blower Door											
Measured/design AP50	5.0000	(17)										
Infiltration rate	0.3675	(18)										
Number of sides sheltered	0	(19)										
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)									
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3675	(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	0.4686	0.4594	0.4502	0.4043	0.3951	0.3491	0.3491	0.3399	0.3675	0.3951	0.4134	0.4318	(22b)
Effective ac	0.6098	0.6055	0.6013	0.5817	0.5780	0.5609	0.5609	0.5578	0.5675	0.5780	0.5855	0.5932	(25)

3. Heat losses and heat loss parameter

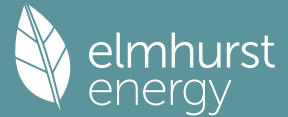
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.6600	1.0000	1.6600			(26)
TER Opening Type (Uw = 1.20)			8.2100	1.1450	9.4008			(27)
External Wall 1	30.0200	9.8700	20.1500	0.1800	3.6270			(29a)
External Wall 2	8.6400		8.6400	0.1800	1.5552			(29a)
External Roof	63.0400		63.0400	0.1100	6.9344			(30)
Total net area of external elements Aum(A, m2)			101.7000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.1774			(33)
Party Wall 1			21.6500	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								161.5444 (35)
Thermal bridges (User defined value 0.050 * total exposed area)								5.0850 (36)
Point Thermal bridges								(36a) = 0.0000
Total fabric heat loss								(33) + (36) + (36a) = 28.2624 (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	34.2504	34.0109	33.7762	32.6739	32.4676	31.5075	31.5075	31.3297	31.8774	32.4676	32.8849	33.3211 (38)
Average = Sum(39)m / 12 =	62.5127	62.2733	62.0386	60.9363	60.7300	59.7699	59.7699	59.5921	60.1397	60.7300	61.1472	61.5834 (39)
												60.9353
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9916	0.9878	0.9841	0.9666	0.9634	0.9481	0.9481	0.9453	0.9540	0.9634	0.9700	0.9769 (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	2.0662 (42)											
Hot water usage for mixer showers	58.8622	57.9776	56.6886	54.2223	52.4022	50.3725	49.2188	50.4981	51.9004	54.0797	56.5990	58.6367 (42a)
Hot water usage for baths	25.4359	25.0581	24.5262	23.5453	22.8109	21.9965	21.5566	22.0849	22.6600	23.5314	24.5325	25.3499 (42b)
Hot water usage for other uses	35.7895	34.4880	33.1866	31.8852	30.5837	29.2823	29.2823	30.5837	31.8852	33.1866	34.4880	35.7895 (42c)
Average daily hot water use (litres/day)												110.3880 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	120.0876	117.5238	114.4014	109.6528	105.7969	101.6513	100.0578	103.1667	106.4456	110.7977	115.6195	119.7761 (44)
Energy content (annual)	190.1894	167.3523	175.8307	150.1092	142.4229	124.9922	121.0112	127.7419	131.2580	150.3515	164.7212	187.5404 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1833.5208

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	28.5284	25.1028	26.3746	22.5164	21.3634	18.7488	18.1517	19.1613	19.6887	22.5527	24.7082	28.1311 (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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	241.1483	213.3797	226.7896	199.4243	193.3818	174.3072	171.9701	178.7008	180.5731	201.3104	214.0362	238.4993 (62)
WWHRS	-26.9093	-23.7988	-24.9208	-20.6354	-19.2314	-16.4565	-15.4253	-16.4033	-17.0265	-20.0724	-22.7396	-26.4110 (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												
	214.2389	189.5809	201.8688	178.7889	174.1504	157.8508	156.5448	162.2975	163.5466	181.2380	191.2967	212.0883 (64)
12Total per year (kWh/year)												2183 (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)
												0.0000 (64a)
Heat gains from water heating, kWh/month												
	75.9777	67.1515	71.2034	62.2401	60.0953	53.8887	52.9759	55.2139	55.9721	62.7316	67.0986	75.0969 (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	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077	103.3077 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.2595	109.8945	99.2595	102.5682	99.2595	102.5682	99.2595	99.2595	102.5682	99.2595	102.5682	99.2595 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.5436	182.4171	177.6960	167.6453	154.9582	143.0340	135.0680	133.1945	137.9156	147.9663	160.6534	172.5776 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308	33.3308 (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)	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461	-82.6461 (71)
Water heating gains (Table 5)	102.1206	99.9278	95.7035	86.4446	80.7733	74.8454	71.2042	74.2122	77.7390	84.3167	93.1924	100.9367 (72)
Total internal gains	438.9160	449.2317	429.6514	413.6504	391.9833	374.4399	359.5240	360.6586	372.2151	388.5348	413.4063	429.7661 (73)

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Northeast			4.4200	11.2829	0.6300	0.7000	0.7700	15.2411 (75)				
Southwest			3.7900	36.7938	0.6300	0.7000	0.7700	42.6173 (79)				
Solar gains	57.8584	103.6168	155.2198	214.8639	261.2380	268.3980	254.9985	219.0178	175.6567	118.1442	70.2230	48.9182 (83)
Total gains	496.7744	552.8485	584.8712	628.5143	653.2213	642.8379	614.5225	579.6764	547.8718	506.6790	483.6293	478.6843 (84)

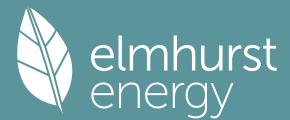
7. Mean internal temperature (heating season)

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	45.2519	45.4259	45.5978	46.4226	46.5803	47.3285	47.3285	47.4698	47.0375	46.5803	46.2625	45.9348
alpha	4.0168	4.0284	4.0399	4.0948	4.1054	4.1552	4.1552	4.1647	4.1358	4.1054	4.0842	4.0623
util living area	0.9728	0.9571	0.9306	0.8621	0.7417	0.5651	0.4207	0.4616	0.6808	0.8815	0.9543	0.9760 (86)
MIT	19.6211	19.8344	20.1246	20.5161	20.8011	20.9521	20.9889	20.9838	20.8957	20.5417	20.0393	19.5992 (87)
Th 2	20.0903	20.0935	20.0966	20.1112	20.1140	20.1268	20.1268	20.1292	20.1218	20.1140	20.1084	20.1026 (88)
util rest of house	0.9675	0.9488	0.9171	0.8357	0.6953	0.4976	0.3404	0.3790	0.6151	0.8531	0.9442	0.9713 (89)
MIT 2	18.4920	18.7618	19.1254	19.6096	19.9333	20.0935	20.1216	20.1210	20.0417	19.6512	19.0331	18.4731 (90)
Living area fraction									fLA = Living area / (4) =			0.4673 (91)
MIT	19.0196	19.2630	19.5923	20.0332	20.3389	20.4947	20.5269	20.5242	20.4408	20.0674	19.5033	18.9993 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0196	19.2630	19.5923	20.0332	20.3389	20.4947	20.5269	20.5242	20.4408	20.0674	19.5033	18.9993 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9595	0.9396	0.9082	0.8332	0.7077	0.5268	0.3776	0.4170	0.6401	0.8514	0.9358	0.9639 (94)
Useful gains	476.6424	519.4801	531.1641	523.6534	462.2852	338.6234	232.0318	241.7502	350.6662	431.3792	452.5804	461.4065 (95)

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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	920.1646	894.4331	812.2292	678.4180	524.6377	352.3281	234.7091	245.7698	381.3332	574.9533	758.4303	911.3940 (97)
Space heating kWh	329.9805	251.9684	209.1124	111.4305	46.3903	0.0000	0.0000	0.0000	0.0000	106.8192	220.2120	334.7907 (98a)
Space heating requirement - total per year (kWh/year)												1610.7040
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	329.9805	251.9684	209.1124	111.4305	46.3903	0.0000	0.0000	0.0000	0.0000	106.8192	220.2120	334.7907 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1610.7040
Space heating per m2										(98c) / (4) =		25.5505 (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	329.9805	251.9684	209.1124	111.4305	46.3903	0.0000	0.0000	0.0000	0.0000	106.8192	220.2120	334.7907 (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)	357.1218	272.6931	226.3121	120.5958	50.2059	0.0000	0.0000	0.0000	0.0000	115.6052	238.3247	362.3276 (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	214.2389	189.5809	201.8688	178.7889	174.1504	157.8508	156.5448	162.2975	163.5466	181.2380	191.2967	212.0883 (64)
Efficiency of water heater (217)m	85.3035	84.9918	84.4571	83.3976	81.9679	80.3000	80.3000	80.3000	80.3000	83.2878	84.6839	80.3000 (216)
Fuel for water heating, kWh/month	251.1489	223.0578	239.0193	214.3813	212.4616	196.5763	194.9499	202.1140	203.6695	217.6046	225.8950	85.3548 (217)
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	248.4783 (219)
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	0.0000 (221)
Lighting	20.6242	16.5455	14.8974	10.9144	8.4306	6.8879	7.6907	9.9967	12.9847	17.0366	19.2428	0.0000 (221)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-29.7927	-42.1521	-60.8085	-68.6395	-74.2643	-69.4371	-68.6172	-64.6840	-57.7372	-48.3682	-32.8224	-25.7431 (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	-16.3587	-34.4744	-68.6249	-103.2085	-136.5839	-137.2500	-135.5973	-114.7209	-83.9952	-49.3021	-21.8446	-12.9281 (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												1743.1862 (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												2629.3565 (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)												166.4489 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1557.9550 (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												3067.0365 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
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Space heating - main system 1	1743.1862	0.2100	366.0691 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2629.3565	0.2100	552.1649 (264)
Space and water heating			918.2340 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	166.4489	0.1443	24.0237 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-643.0664	0.1345	-86.4905
PV Unit electricity exported	-914.8886	0.1259	-115.1503
Total			-201.6407 (269)
Total CO2, kg/year			752.5462 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9400 (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	1743.1862	1.1300	1969.8004 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2629.3565	1.1300	2971.1728 (278)
Space and water heating			4940.9732 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	166.4489	1.5338	255.3048 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-643.0664	1.4971	-962.7173
PV Unit electricity exported	-914.8886	0.4620	-422.6797
Total			-1385.3970 (283)
Total Primary energy kWh/year			3940.9818 (286)
Target Primary Energy Rate (TPER)			62.5200 (287)

Full SAP Calculation Printout



Property Reference	Unit 4	Issued on Date	07/08/2023
Assessment Reference	Be Lean	Prop Type Ref	
Property	155, Tottenham Lane, London, N8 9BT		
SAP Rating	72 C	DER	34.61
Environmental	77 C	TER	14.55
CO ₂ Emissions (t/year)	1.44	% DER < TER	-137.87
Compliance Check	See BREL	DFEE	77.65
% DPER < TPER	-154.75	TFEE	41.11
		% DFEE < TFEE	-88.90
		DPER	195.11
		TPER	76.59
Assessor Details	Mr. Andrew Taylor	Assessor ID	P741-0001
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	47.2000 (1b)	2.7000 (2b)	127.4400 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.2000		127.4400 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 127.4400 (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)

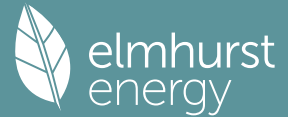
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	8.0000 (17)
Infiltration rate	0.4000 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.4000 (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	0.5100	0.5000	0.4900	0.4400	0.4300	0.3800	0.3800	0.3700	0.4000	0.4300	0.4500	0.4700 (22b)
Mechanical extract ventilation - decentralised												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)												
Effective ac	0.7600	0.7500	0.7400	0.6900	0.6800	0.6300	0.6300	0.6200	0.6500	0.6800	0.7000	0.7200 (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
Windows (Uw = 1.60)			8.9900	1.5038	13.5188		(27)
External Wall 1	52.1100	4.1300	47.9800	0.3000	14.3940	150.0000	7197.0000 (29a)
External Wall 2	12.4200	4.8600	7.5600	0.3000	2.2680	150.0000	1134.0000 (29a)
External Roof 1	47.2200		47.2200	0.1400	6.6108	9.0000	424.9800 (30)

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Total net area of external elements Aum(A, m2)	111.7500											(31)
Fabric heat loss, W/K = Sum(A x U)	(26)...(30) + (32) =	36.7916										(33)
Party Wall 1	13.4400	0.0000										(32)
Party Floor 1	47.2200											(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11113.3800										(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												(35)
Thermal bridges (Default value 0.200 * total exposed area)												(36)
Point Thermal bridges												(36a) =
Total fabric heat loss	(33) + (36) + (36a) =	59.1416										(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	31.9620	31.5414	31.1208	29.0181	28.5975	26.4948	26.4948	26.0742	27.3359	28.5975	29.4386	30.2797 (38)
Heat transfer coeff												
	91.1035	90.6830	90.2624	88.1597	87.7391	85.6364	85.6364	85.2158	86.4775	87.7391	88.5802	89.4213 (39)
Average = Sum(39)m / 12 =												88.0545

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.9302	1.9212	1.9123	1.8678	1.8589	1.8143	1.8143	1.8054	1.8321	1.8589	1.8767	1.8945	(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													1.6081	(42)
Hot water usage for mixer showers														
Hot water usage for baths	90.3072	88.9501	86.9724	83.1886	80.3963	77.2822	75.5122	77.4749	79.6263	82.9698	86.8349	89.9612	(42a)	
Hot water usage for other uses	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)	
Average daily hot water use (litres/day)	32.7352	31.5449	30.3545	29.1641	27.9738	26.7834	26.7834	27.9738	29.1641	30.3545	31.5449	32.7352	(42c)	
												113.0195	(43)	

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	123.0425	120.4949	117.3269	112.3527	108.3700	104.0656	102.2956	105.4486	108.7904	113.3243	118.3798	122.6964	(44)
Energy content (annual)	194.8692	171.5832	180.3271	153.8053	145.8869	127.9608	123.7177	130.5674	134.1495	153.7800	168.6537	192.1130	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	29.2304	25.7375	27.0491	23.0708	21.8830	19.1941	18.5577	19.5851	20.1224	23.0670	25.2981	28.8169	(46)
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	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	245.8281	217.6106	231.2860	203.1204	196.8458	177.2759	174.6766	181.5263	183.4646	204.7389	217.9688	243.0719	(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	245.8281	217.6106	231.2860	203.1204	196.8458	177.2759	174.6766	181.5263	183.4646	204.7389	217.9688	243.0719	(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	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	77.5337	68.5583	72.6985	63.4690	61.2471	54.8757	53.8759	56.1534	56.9335	63.8716	68.4061	76.6173	(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	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	71.5094	79.1711	71.5094	73.8930	71.5094	73.8930	71.5094	71.5094	73.8930	71.5094	73.8930	71.5094	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	139.9674	141.4198	137.7597	129.9679	120.1321	110.8878	104.7121	103.2597	106.9198	114.7116	124.5474	133.7916	(68)
Pumps, fans	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	(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)	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	(71)
Total internal gains	104.2120	102.0212	97.7130	88.1514	82.3214	76.2163	72.4138	75.4750	79.0743	85.8489	95.0085	102.9802	(72)
	365.8101	372.7335	357.1035	342.1337	324.0842	308.1186	295.7567	297.3655	307.0084	322.1913	343.5703	358.4026	(73)

6. Solar gains

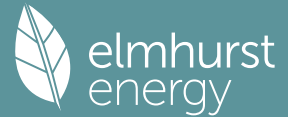
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[Jan]			Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W		
Northeast			0.8900		11.2829		0.6300		0.7000		0.7700		3.0689 (75)		
Southwest			3.2400		36.7938		0.6300		0.7000		0.7700		36.4327 (79)		
Northwest			4.8600		11.2829		0.6300		0.7000		0.7700		16.7583 (81)		
Solar gains			56.2600	102.4173	157.6250	224.6260	278.3628	288.1219	272.8813	230.9915	180.5437	117.9096	68.5858	47.3707 (83)	
Total gains			422.0701	475.1508	514.7285	566.7598	602.4470	596.2405	568.6379	528.3569	487.5522	440.1008	412.1561	405.7734 (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	33.8851	34.0422	34.2008	35.0166	35.1844	36.0484	36.0484	36.2263	35.6977	35.1844	34.8503	34.5225			
alpha	3.2590	3.2695	3.2801	3.3344	3.3456	3.4032	3.4032	3.4151	3.3798	3.3456	3.3234	3.3015			
util living area	0.9889	0.9827	0.9710	0.9392	0.8705	0.7393	0.5968	0.6476	0.8426	0.9529	0.9823	0.9903 (86)			
MIT	18.7124	18.9393	19.3188	19.8810	20.3887	20.7734	20.9209	20.8945	20.6085	19.9660	19.2724	18.7063 (87)			
Th 2	19.3803	19.3864	19.3924	19.4229	19.4291	19.4600	19.4600	19.4662	19.4476	19.4291	19.4168	19.4046 (88)			
util rest of house	0.9851	0.9767	0.9604	0.9147	0.8132	0.6200	0.4164	0.4709	0.7509	0.9288	0.9751	0.9870 (89)			
MIT 2	17.3951	17.6234	18.0014	18.5660	19.0343	19.3617	19.4428	19.4398	19.2446	18.6618	17.9762	17.4054 (90)			
Living area fraction	fLA = Living area / (4) =												0.5282 (91)		
MIT	18.0909	18.3184	18.6972	19.2606	19.7497	20.1073	20.2235	20.2082	19.9650	19.3507	18.6608	18.0925 (92)			
Temperature adjustment													0.0000		
adjusted MIT	18.0909	18.3184	18.6972	19.2606	19.7497	20.1073	20.2235	20.2082	19.9650	19.3507	18.6608	18.0925 (93)			
8. Space heating requirement															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisation	0.9808	0.9713	0.9543	0.9115	0.8269	0.6754	0.5118	0.5635	0.7867	0.9272	0.9704	0.9831 (94)			
Useful gains	413.9819	461.5213	491.1815	516.6176	498.1661	402.6911	291.0198	297.7042	383.5438	408.0603	399.9551	398.9224 (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	1256.3988	1216.8237	1100.9504	913.3846	706.2727	471.6261	310.3031	324.5158	507.1896	767.7750	1024.0568	1242.2863 (97)			
Space heating kWh	626.7582	507.5632	453.6681	285.6722	154.8313	0.0000	0.0000	0.0000	0.0000	267.6277	449.3532	627.4627 (98a)			
Space heating requirement - total per year (kWh/year)													3372.9367		
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	626.7582	507.5632	453.6681	285.6722	154.8313	0.0000	0.0000	0.0000	0.0000	267.6277	449.3532	627.4627 (98c)			
Space heating requirement after solar contribution - total per year (kWh/year)													3372.9367		
Space heating per m2	(98c) / (4) =												71.4605 (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 %)													79.0000 (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	626.7582	507.5632	453.6681	285.6722	154.8313	0.0000	0.0000	0.0000	0.0000	267.6277	449.3532	627.4627 (98)			
Space heating efficiency (main heating system 1)	79.0000	79.0000	79.0000	79.0000	79.0000	0.0000	0.0000	0.0000	0.0000	79.0000	79.0000	79.0000 (210)			
Space heating fuel (main heating system)	793.3648	642.4851	574.2634	361.6104	195.9890	0.0000	0.0000	0.0000	0.0000	338.7692	568.8015	794.2566 (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	245.8281	217.6106	231.2860	203.1204	196.8458	177.2759	174.6766	181.5263	183.4646	204.7389	217.9688	243.0719 (64)			
Efficiency of water heater	81.2531	81.0803	80.7289	80.0102	78.7130	75.0000	75.0000	75.0000	75.0000	79.8470	80.8317	75.0000 (216)			
Fuel for water heating, kWh/month	302.5461	268.3889	286.4973	253.8682	250.0804	236.3678	232.9021	242.0351	244.6194	256.4140	269.6575	299.0671 (219)			
Space cooling fuel requirement	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	33.7139	30.4512	33.7139	32.6263	33.7139	32.6263	33.7139	33.7139	32.6263	33.7139	32.6263	33.7139 (231)			
Lighting	18.8320	15.1077	13.6028	9.9660	7.6980	6.2894	7.0224	9.1280	11.8564	15.5562	17.5707	19.3554 (232)			

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Dwelling volume

(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 127.4400 (5)

2. Ventilation rate

m3 per hour

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1569 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4069	(18)
Number of sides sheltered	0	(19)

Shelter factor

(20) = 1 - [0.075 x (19)] = 1.0000 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.4069 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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)
Adj infilt rate	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)
Effective ac	0.5188	0.5087	0.4985	0.4476	0.4375	0.3866	0.3866	0.3764	0.4069	0.4375	0.4578	0.4782 (22b)
	0.6346	0.6294	0.6242	0.6002	0.5957	0.5747	0.5747	0.5708	0.5828	0.5957	0.6048	0.6143 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			8.9900	1.1450	10.2939		(27)
External Wall 1	52.1100	4.1300	47.9800	0.1800	8.6364		(29a)
External Wall 2	12.4200	4.8600	7.5600	0.1800	1.3608		(29a)
External Roof 1	47.2200		47.2200	0.1100	5.1942		(30)
Total net area of external elements Aum(A, m2)			111.7500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.4853		(33)
Party Wall 1			13.4400	0.0000	0.0000		(32)

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

235.4530 (35)

Thermal bridges (User defined value 0.050 * total exposed area)

5.5875 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 31.0728 (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	26.6882	26.4684	26.2529	25.2410	25.0516	24.1702	24.1702	24.0070	24.5097	25.0516	25.4347	25.8351 (38)
Average = Sum(39)m / 12 =	57.7610	57.5412	57.3257	56.3138	56.1244	55.2430	55.2430	55.0798	55.5825	56.1244	56.5074	56.9079 (39)
												56.3128

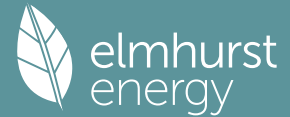
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2238	1.2191	1.2145	1.1931	1.1891	1.1704	1.1704	1.1669	1.1776	1.1891	1.1972	1.2057 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6081 (42)
Hot water usage for mixer showers												
	65.6780	64.6910	63.2527	60.5008	58.4700	56.2053	54.9180	56.3454	57.9100	60.3417	63.1527	65.4263 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	31.0985	29.9676	28.8368	27.7059	26.5751	25.4442	25.4442	26.5751	27.7059	28.8368	29.9676	31.0985 (42c)
Average daily hot water use (litres/day)												88.8242 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.7765	94.6586	92.0895	88.2067	85.0451	81.6495	80.3622	82.9204	85.6160	89.1785	93.1203	96.5248 (44)
Energy content (annual)	153.2702	134.7926	141.5381	120.7506	114.4870	100.3976	97.1911	102.6728	105.5730	121.0143	132.6669	151.1345 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1475.4888
	22.9905	20.2189	21.2307	18.1126	17.1731	15.0596	14.5787	15.4009	15.8360	18.1522	19.9000	22.6702 (46)
Water storage loss:												

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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	49.3162	43.5689	46.9278	43.4992	43.3380	40.2655	40.9517	42.2553	42.2216	45.4444	45.9223	49.1880 (61)
Total heat required for water heating calculated for each month	202.5865	178.3614	188.4658	164.2498	157.8250	140.6630	138.1428	144.9282	147.7946	166.4587	178.5893	200.3225 (62)
WWHRS	-30.0252	-26.5546	-27.8064	-23.0248	-21.4583	-18.3620	-17.2115	-18.3027	-18.9980	-22.3966	-25.3726	-29.4692 (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	172.5612	151.8069	160.6594	141.2250	136.3668	122.3010	120.9313	126.6255	128.7966	144.0621	153.2167	170.8533 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											1729.4059 (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)
Heat gains from water heating, kWh/month	63.2914	55.7107	58.7934	51.0244	48.9014	43.4486	42.5540	44.7025	45.6584	51.5984	55.5923	62.5492 (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	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	80.4046	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	71.5094	79.1711	71.5094	73.8930	71.5094	73.8930	71.5094	71.5094	73.8930	71.5094	73.8930	71.5094	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	139.9674	141.4198	137.7597	129.9679	120.1321	110.8878	104.7121	103.2597	106.9198	114.7116	124.5474	133.7916	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	31.0405	(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)	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	-64.3237	(71)
Water heating gains (Table 5)	85.0691	82.9029	79.0233	70.8672	65.7277	60.3452	57.1962	60.0841	63.4145	69.3526	77.2116	84.0715	(72)
Total internal gains	346.6672	353.6152	338.4138	324.8495	307.4906	292.2475	280.5391	281.9745	291.3486	305.6950	325.7734	339.4939	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast				0.8900	11.2829		0.6300		0.7000		0.7700		3.0689 (75)
Southwest				3.2400	36.7938		0.6300		0.7000		0.7700		36.4327 (79)
Northwest				4.8600	11.2829		0.6300		0.7000		0.7700		16.7583 (81)
Solar gains	56.2600	102.4173	157.6250	224.6260	278.3628	288.1219	272.8813	230.9915	180.5437	117.9096	68.5858	47.3707	(83)
Total gains	402.9272	456.0325	496.0388	549.4755	585.8534	580.3694	553.4203	512.9660	471.8924	423.6045	394.3592	386.8647	(84)

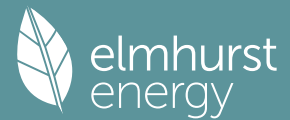
7. Mean internal temperature (heating season)

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	53.4452	53.6494	53.8510	54.8188	55.0037	55.8813	55.8813	56.0469	55.5400	55.0037	54.6309	54.2464
alpha	4.5630	4.5766	4.5901	4.6546	4.6669	4.7254	4.7254	4.7365	4.7027	4.6669	4.6421	4.6164
util living area	0.9891	0.9798	0.9601	0.8990	0.7729	0.5849	0.4341	0.4849	0.7300	0.9266	0.9792	0.9908 (86)
MIT	19.6711	19.8731	20.1652	20.5574	20.8366	20.9665	20.9933	20.9890	20.9075	20.5483	20.0580	19.6508 (87)
Th 2	19.9010	19.9048	19.9084	19.9255	19.9287	19.9438	19.9438	19.9465	19.9380	19.9287	19.9222	19.9155 (88)
util rest of house	0.9858	0.9738	0.9480	0.8695	0.7140	0.4982	0.3325	0.3784	0.6458	0.8984	0.9720	0.9880 (89)
MIT 2	18.3830	18.6406	19.0079	19.4918	19.7968	19.9253	19.9417	19.9427	19.8779	19.4951	18.8892	18.3676 (90)
Living area fraction	19.0633	19.2916	19.6192	20.0546	20.3460	20.4752	20.4971	20.4954	20.4217	20.0514	19.5065	19.0454 (92)
MIT	19.0633	19.2916	19.6192	20.0546	20.3460	20.4752	20.4971	20.4954	20.4217	20.0514	19.5065	19.0454 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	395.8718	442.1760	468.3337	479.9265	432.5406	315.0455	213.7629	222.9677	323.8280	382.1501	381.9365	381.0951 (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)

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Heat loss rate W	852.7454	828.1095	752.0656	628.1600	485.2513	324.5663	215.2885	225.5715	351.3778	530.4525	701.0599	844.8184 (97)
Space heating kWh	339.9139	259.3473	211.0965	106.7281	39.2168	0.0000	0.0000	0.0000	0.0000	110.3369	229.7688	345.0101 (98a)
Space heating requirement - total per year (kWh/year)												1641.4186
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	339.9139	259.3473	211.0965	106.7281	39.2168	0.0000	0.0000	0.0000	0.0000	110.3369	229.7688	345.0101 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1641.4186
Space heating per m2										(98c) / (4) =		34.7758 (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	339.9139	259.3473	211.0965	106.7281	39.2168	0.0000	0.0000	0.0000	0.0000	110.3369	229.7688	345.0101 (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)	367.8722	280.6789	228.4595	115.5066	42.4424	0.0000	0.0000	0.0000	0.0000	119.4123	248.6676	373.3876 (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	172.5612	151.8069	160.6594	141.2250	136.3668	122.3010	120.9313	126.6255	128.7966	144.0621	153.2167	170.8533 (64)
Efficiency of water heater	85.8057	85.5183	84.9674	83.7889	82.0733	80.3000	80.3000	80.3000	80.3000	83.8167	85.2475	85.8547 (216)
Fuel for water heating, kWh/month	201.1071	177.5138	189.0837	168.5485	166.1524	152.3052	150.5994	157.6905	160.3942	171.8776	179.7315	199.0029 (219)
Space cooling fuel requirement	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)
(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	14.8582	11.9198	10.7325	7.8631	6.0737	4.9622	5.5406	7.2019	9.3545	12.2737	13.8631	15.2712 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-22.5608	-32.0589	-46.4682	-52.7401	-57.3447	-53.7585	-53.1510	-49.9715	-44.3902	-36.9358	-24.9138	-19.4803 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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)	-11.9942	-25.3137	-50.4426	-75.9278	-100.5239	-100.9945	-99.7508	-84.3545	-61.7292	-36.1930	-16.0170	-9.4741 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)	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)	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												1776.4270 (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												2074.0070 (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)												119.9145 (232)
Energy saving/generation technologies (Appendices M, N and Q)												
PV generation												-1166.4891 (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												2889.8593 (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	1776.4270	0.2100	373.0497 (261)

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Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2074.0070	0.2100	435.5415 (264)
Space and water heating			808.5911 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	119.9145	0.1443	17.3074 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-493.7738	0.1344	-66.3515
PV Unit electricity exported	-672.7153	0.1258	-84.6580
Total			-151.0096 (269)
Total CO2, kg/year			686.8182 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.5500 (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	1776.4270	1.1300	2007.3625 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2074.0070	1.1300	2343.6279 (278)
Space and water heating			4350.9904 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	119.9145	1.5338	183.9288 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-493.7738	1.4966	-738.9919
PV Unit electricity exported	-672.7153	0.4619	-310.7526
Total			-1049.7444 (283)
Total Primary energy kWh/year			3615.2756 (286)
Target Primary Energy Rate (TPER)			76.5900 (287)



Appendix 3

GHA Overheating Tool

EARLY STAGE OVERHEATING RISK TOOL Version 1.0, July 2019

This tool provides guidance on how to assess overheating risk in residential schemes at the early stages of design. It is specifically a pre-detail design assessment intended to help identify factors that could contribute to or mitigate the likelihood of overheating.

The questions can be answered for an overall scheme or for individual units. Score zero wherever the question does not apply. Additional information is provided in the accompanying guidance, with examples of scoring and advice on next steps.

Find out more information and download accompanying guidance at goodhomes.org.uk/overheating-in-new-homes.



KEY FACTORS INCREASING THE LIKELIHOOD OF OVERHEATING

KEY FACTORS REDUCING THE LIKELIHOOD OF OVERHEATING

Geographical and local context

#1 Where is the scheme in the UK? See guidance for map	South east	4	4
	Northern England, Scotland & NI	0	
	Rest of England and Wales	2	
#2 Is the site likely to see an Urban Heat Island effect? See guidance for details	Central London (see guidance)	3	2
	Grtr London, Manchester, B'ham	2	
	Other cities, towns & dense sub-urban areas	1	

#8 Do the site surroundings feature significant blue/green infrastructure? Proximity to green spaces and large water bodies has beneficial effects on local temperatures; as guidance, this would require at least 50% of surroundings within a 100m radius to be blue/green, or a rural context	1	0
---	---	---

Site characteristics

#3 Does the site have barriers to windows opening? - Noise/Acoustic risks - Poor air quality/smells e.g. near factory or car park or very busy road - Security risks/crime - Adjacent to heat rejection plant	Day - reasons to keep all windows closed	8	4
	Day - barriers some of the time, or for some windows e.g. on quiet side	4	
	Night - reasons to keep all windows closed	8	0
	Night - bedroom windows OK to open, but other windows are likely to stay closed	4	

#9 Are immediate surrounding surfaces in majority pale in colour, or blue/green? Lighter surfaces reflect more heat and absorb less so their temperatures remain lower; consider horizontal and vertical surfaces within 10m of the scheme	1	0
---	---	---

#10 Does the site have existing tall trees or buildings that will shade solar-exposed glazed areas? Shading onto east, south and west facing areas can reduce solar gains, but may also reduce daylight levels	1	1
---	---	---

Scheme characteristics and dwelling design

#4 Are the dwellings flats? Flats often combine a number of factors contributing to overheating risk e.g. dwelling size, heat gains from surrounding areas; other dense and enclosed dwellings may be similarly affected - see guidance for examples	3	3
#5 Does the scheme have community heating? i.e. with hot pipework operating during summer, especially in internal areas, leading to heat gains and higher temperatures	3	0

#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation? Thermal mass can help slow down temperature rises, but it can also cause properties to be slower to cool, so needs to be used with care - see guidance	1	0
---	---	---

#12 Do floor-to-ceiling heights allow ceiling fans, now or in the future? Higher ceilings increase stratification and air movement, and offer the potential for ceiling fans	>2.8m and fan installed	2	0
	> 2.8m	1	

Solar heat gains and ventilation

#6 What is the estimated average glazing ratio for the dwellings? (as a proportion of the facade on solar-exposed areas i.e. orientations facing east, south, west, and anything in between). Higher proportions of glazing allow higher heat gains into the space	>65%	12	0
	>50%	7	
	>35%	4	

#13 Is there useful external shading? Shading should apply to solar exposed (E/S/W) glazing. It may include shading devices, balconies above, facade articulation etc. See guidance on "full" and "part". Scoring depends on glazing proportions as per #6		Full	Part	0
	>65%	6	3	
	>50%	4	2	
	>35%	2	1	

#7 Are the dwellings single aspect? Single aspect dwellings have all openings on the same facade. This reduces the potential for ventilation	Single-aspect	3	0
	Dual aspect	0	

#14 Do windows & openings support effective ventilation? Larger, effective and secure openings will help dissipate heat - see guidance	Openings compared to Part F purge rates			3
		= Part F	+50%	+100%
	Single-aspect	minimum	3	4
	Dual aspect	required	2	3

TOTAL SCORE **9** = Sum of contributing factors: **13** minus Sum of mitigating factors: **4**



score >12:
Incorporate design changes to reduce risk factors and increase mitigation factors AND Carry out a detailed assessment (e.g. dynamic modelling against CIBSE TM59)

score between 8 and 12:
Seek design changes to reduce risk factors and/or increase mitigation factors AND Carry out a detailed assessment (e.g. dynamic modelling against CIBSE TM59)

score <8:
Ensure the mitigating measures are retained, and that risk factors do not increase (e.g. in planning conditions)



Appendix 4

Urban Greening Factor

155 Tottenham Lane - Pre-Development

Introduction

This calculator should be used in conjunction with London Plan Guidance 'Urban Greening Factor', 2021.

The Urban Greening Factor (UGF) is a tool that evaluates and quantifies the urban greening proposed in new developments. The UGF works by assigning a factor score to each surface cover type proposed in a planning application. Scores range from 1 for semi natural vegetation, through to 0 for impermeable sealed surfaces.

Instructions

- Cells highlighted in green should be completed by the applicant;
- Green cover should be categorised in accordance with Appendix 1 of the UGF guidance;
- The notes column should be used to record any assumptions (e.g. how expected tree canopy has been calculated) and to set out which features (e.g. the type of semi-natural habitat) have been included in the appropriate row;
- The calculation table should be copied to UGF drawing to be submitted for planning; □
- The UGF should always be calculated on the total site area, equivalent to the red line boundary;
- Adjacent areas of land under the ownership or management of the applicant but not subject to the planning application must not be included; and
- Retained surface cover types should be included in the calculation.

Urban Greening Factor Calculator				
Surface Cover Type	Factor	Area (m²)	Contribution	Notes
Semi-natural vegetation (e.g. trees, woodland, species-rich grassland) maintained or established on site.	1	0	0	
Wetland or open water (semi-natural; not chlorinated) maintained or established on site.	1	0	0	
Intensive green roof or vegetation over structure. Substrate minimum settled depth of 150mm.	0.8	0	0	
Standard trees planted in connected tree pits with a minimum soil volume equivalent to at least two thirds of the projected canopy area of the mature tree.	0.8	0	0	
Extensive green roof with substrate of minimum settled depth of 80mm (or 60mm beneath vegetation blanket) – meets the requirements of GRO Code 2014.	0.7	0	0	
Flower-rich perennial planting.	0.7	0	0	
Rain gardens and other vegetated sustainable drainage elements.	0.7	0	0	
Hedges (line of mature shrubs one or two shrubs wide).	0.6	0	0	
Standard trees planted in pits with soil volumes less than two thirds of the projected canopy area of the mature tree.	0.6	0	0	
Green wall –modular system or climbers rooted in soil.	0.6	0	0	
Groundcover planting.	0.5	0	0	
Amenity grassland (species-poor, regularly mown lawn).	0.4	0	0	
Extensive green roof of sedum mat or other lightweight systems that do not meet GRO Code 2014.	0.3	0	0	
Water features (chlorinated) or unplanted detention basins.	0.2	0	0	
Permeable paving.	0.1	0	0	
Sealed surfaces (e.g. concrete, asphalt, waterproofing, stone).	0	171.87	0	
Total contribution			0	
Total site area (m²)			171.87	
Urban Greening Factor			0	

155 Tottenham Lane - Post-Development

Introduction

This calculator should be used in conjunction with London Plan Guidance 'Urban Greening Factor', 2021.

The Urban Greening Factor (UGF) is a tool that evaluates and quantifies the urban greening proposed in new developments. The UGF works by assigning a factor score to each surface cover type proposed in a planning application. Scores range from 1 for semi natural vegetation, through to 0 for impermeable sealed surfaces.

Instructions

- Cells highlighted in green should be completed by the applicant;
- Green cover should be categorised in accordance with Appendix 1 of the UGF guidance;
- The notes column should be used to record any assumptions (e.g. how expected tree canopy has been calculated) and to set out which features (e.g. the type of semi-natural habitat) have been included in the appropriate row;
- The calculation table should be copied to UGF drawing to be submitted for planning; □
- The UGF should always be calculated on the total site area, equivalent to the red line boundary;
- Adjacent areas of land under the ownership or management of the applicant but not subject to the planning application must not be included; and
- Retained surface cover types should be included in the calculation.

Urban Greening Factor Calculator				
Surface Cover Type	Factor	Area (m²)	Contribution	Notes
Semi-natural vegetation (e.g. trees, woodland, species-rich grassland) maintained or established on site.	1	0	0	
Wetland or open water (semi-natural; not chlorinated) maintained or established on site.	1	0	0	
Intensive green roof or vegetation over structure. Substrate minimum settled depth of 150mm.	0.8	0	0	
Standard trees planted in connected tree pits with a minimum soil volume equivalent to at least two thirds of the projected canopy area of the mature tree.	0.8	0	0	
Extensive green roof with substrate of minimum settled depth of 80mm (or 60mm beneath vegetation blanket) – meets the requirements of GRO Code 2014.	0.7	0	0	
Flower-rich perennial planting.	0.7	0	0	
Rain gardens and other vegetated sustainable drainage elements.	0.7	0	0	
Hedges (line of mature shrubs one or two shrubs wide).	0.6	0	0	
Standard trees planted in pits with soil volumes less than two thirds of the projected canopy area of the mature tree.	0.6	5.47	3.282	
Green wall –modular system or climbers rooted in soil.	0.6	0	0	
Groundcover planting.	0.5	3.2	1.6	
Amenity grassland (species-poor, regularly mown lawn).	0.4	0	0	
Extensive green roof of sedum mat or other lightweight systems that do not meet GRO Code 2014.	0.3	0	0	
Water features (chlorinated) or unplanted detention basins.	0.2	0	0	
Permeable paving.	0.1	19.26	1.926	
Sealed surfaces (e.g. concrete, asphalt, waterproofing, stone).	0	171.87	0	
Total contribution			6.808	
Total site area (m²)				171.87
Urban Greening Factor			0.039611334	



Appendix 5

Water Consumption Calculation



Job no:

Date: 01/08/2023

Assessor name: Tom Reynolds

Registration no:

Development name: 155 Tottenham Lane

Issue Date:

Rainwater

Greywater

Results

WATER EFFICIENCY CALCULATOR FOR NEW DWELLINGS

(for use with the Code for Sustainable Homes issues Wat 1 for the May 2009 and subsequent versions)

Dwelling Description Flats 1, 2 & 4

1st step - Select from options below:

Is a Rain and/or Greywater system specified?	No
Is a shower AND bath present?	Yes
Has a washing machine been specified?	No
Has a dishwasher been specified?	No

2nd step - Build spreadsheet (click button below)

[BUILD SPREADSHEET](#)

As soon as this button is pressed the spreadsheet will change according to the options selected previously in the 1st step. Scroll down to see the changes.

3rd step - Enter consumption details for the specified fittings

TAPS (excluding kitchen taps)		Fitting type	Flow rate (litres/min)	Number of fittings
	1	Basin Taps	6.00	1
	2			
	3			
	4			
	Proportionate flow rate (litres/min)			4.20

	Consumption / person / day (Litres)	11.06
--	-------------------------------------	-------

BATHS		Fitting type	Capacity to overflow (litres)	Number of fittings
	1	Bath	170.00	1
	2			
	3			
	4			
	Proportionate capacity to overflow (litres)			119.00
		Consumption / person / day (Litres)		18.70
SHOWERS		Fitting type	Flow rate (litres/min)	Number of fittings
	1	Showers	8.00	1
	2			
	3			
	4			
	Proportionate flow rate (litres/min)			5.60
		Consumption / person / day (Litres)		34.96
DISHWASHER				
Where no dishwasher is specified, a default consumption figure of 1.25 litres per place setting is used.				
		Consumption / person / day (Litres)		4.50

WASHING MACHINES				Number of fittings
Where no washing machine is specified, a default consumption figure of 8.17 litres per kilogram of dry load is used.				
Where no washing machines have been specified but plumbing for future supply of grey/rainwater was installed, please enter details:				
		Consumption / person / day (Litres)	17.16	

WC's	Fitting Type	Flush Type	Volume**	Number of fittings
1	WCs	Full Flush	4.00	1
		Part Flush	2.60	
2		Full Flush		
		Part Flush		
3		Full Flush		
		Part Flush		
4		Full Flush		
		Part Flush		
		Average effective flushing volume (litres)		3.06
		Consumption / person / day (Litres)		13.53

KITCHEN SINK TAPS		Fitting Type	Flow rate (litres/minute)	Number of fittings
	1	Kitchen Taps	10.00	1
	2			
	3			
	4			
		Proportionate flow rate (litres/min)		7.00
		Consumption / person / day (Litres)		14.76
WASTE DISPOSAL UNIT				
Is a waste disposal unit specified for the dwelling?		No		
		Consumption / person / day (Litres)		0.00
WATER SOFTENER				
Water Softener in use?		No		
Total capacity used per regeneration (%)				
Water consumed per regeneration (litres)				
Average number of regeneration cycles per day (No.)				
Number of occupants served by the system (No.)				
		Water consumed beyond 4% person / day (Litres)		0.00

4th step - Analyse Results[Go to Start](#)**INTERNAL WATER CONSUMPTION**

NET INTERNAL WATER CONSUMPTION	(litres/person/day)	114.67
RAINWATER ONLY COLLECTION SAVING	(litres/person/day)	0.00
GREYWATER ONLY RECYCLING SAVING	(litres/person/day)	0.00
RAIN/GREYWATER COLLECTION SAVING (combined system)	(litres/person/day)	0.00
NORMALISATION FACTOR	(litres/person/day)	0.91
TOTAL WATER CONSUMPTION	(litres/person/day)	104.4
CSH CREDITS ACHIEVED		3
CSH MANDATORY LEVEL:		Level 3/4

17. K COMPLIANCE

EXTERNAL WATER USE	(litres / person / day)	5.00
TOTAL WATER CONSUMPTION	(litres / person / day)	109.4
17. K COMPLIANCE?		Yes

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Job no:

Date: 01/08/2023

Assessor name: Tom Reynolds

Registration no:

Development name: 155 Tottenham Lane

Issue Date:

Rainwater

Greywater

Results

WATER EFFICIENCY CALCULATOR FOR NEW DWELLINGS

(for use with the Code for Sustainable Homes issues Wat 1 for the May 2009 and subsequent versions)

Dwelling Description Flat 3

1st step - Select from options below:

Is a Rain and/or Greywater system specified?	No
Is a shower AND bath present?	Yes
Has a washing machine been specified?	No
Has a dishwasher been specified?	No

2nd step - Build spreadsheet (click button below)

[BUILD SPREADSHEET](#)

As soon as this button is pressed the spreadsheet will change according to the options selected previously in the 1st step. Scroll down to see the changes.

3rd step - Enter consumption details for the specified fittings

TAPS (excluding kitchen taps)		Fitting type	Flow rate (litres/min)	Number of fittings
	1	Basin Taps	6.00	2
	2			
	3			
	4			
	Proportionate flow rate (litres/min)			4.20

		Consumption / person / day (Litres)	11.06
BATHS			
	Fitting type	Capacity to overflow (litres)	Number of fittings
	1	Bath	170.00
	2		
	3		
	4		
	Proportionate capacity to overflow (litres)		119.00
		Consumption / person / day (Litres)	18.70
SHOWERS			
	Fitting type	Flow rate (litres/min)	Number of fittings
	1	Showers	8.00
	2		
	3		
	4		
	Proportionate flow rate (litres/min)		5.60
		Consumption / person / day (Litres)	34.96
DISHWASHER			
Where no dishwasher is specified, a default consumption figure of 1.25 litres per place setting is used.			
		Consumption / person / day (Litres)	4.50

WASHING MACHINES				Number of fittings
Where no washing machine is specified, a default consumption figure of 8.17 litres per kilogram of dry load is used.				
Where no washing machines have been specified but plumbing for future supply of grey/rainwater was installed, please enter details:				
		Consumption / person / day (Litres)	17.16	

WC's	Fitting Type	Flush Type	Volume**	Number of fittings
1	WCs	Full Flush	4.00	1
		Part Flush	2.60	
2		Full Flush		
		Part Flush		
3		Full Flush		
		Part Flush		
4		Full Flush		
		Part Flush		
		Average effective flushing volume (litres)		3.06
		Consumption / person / day (Litres)		13.53

KITCHEN SINK TAPS		Fitting Type	Flow rate (litres/minute)	Number of fittings
	1	Kitchen Taps	10.00	1
	2			
	3			
	4			
		Proportionate flow rate (litres/min)		7.00
		Consumption / person / day (Litres)		14.76
WASTE DISPOSAL UNIT				
Is a waste disposal unit specified for the dwelling?			No	
			Consumption / person / day (Litres)	0.00
WATER SOFTENER				
Water Softener in use?			No	
Total capacity used per regeneration (%)				
Water consumed per regeneration (litres)				
Average number of regeneration cycles per day (No.)				
Number of occupants served by the system (No.)				
			Water consumed beyond 4% person / day (Litres)	0.00

4th step - Analyse Results[Go to Start](#)**INTERNAL WATER CONSUMPTION**

NET INTERNAL WATER CONSUMPTION	(litres/person/day)	114.67
RAINWATER ONLY COLLECTION SAVING	(litres/person/day)	0.00
GREYWATER ONLY RECYCLING SAVING	(litres/person/day)	0.00
RAIN/GREYWATER COLLECTION SAVING (combined system)	(litres/person/day)	0.00
NORMALISATION FACTOR	(litres/person/day)	0.91
TOTAL WATER CONSUMPTION	(litres/person/day)	104.4
CSH CREDITS ACHIEVED		3
CSH MANDATORY LEVEL:		Level 3/4

17. K COMPLIANCE

EXTERNAL WATER USE	(litres / person / day)	5.00
TOTAL WATER CONSUMPTION	(litres / person / day)	109.4
17. K COMPLIANCE?		Yes

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