

Energy Statement

12 Canning Crescent, London

Job number: 12596

Date: June 2026

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Revision	Issue Date	Author	Description
0.0	16.12.2024	PK	First Issue
1.0	19.06.2026	NG	Second Issue

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1 Executive Summary

This report has been produced by Base Energy on behalf of Bilal Ustun Ltd and in support of the planning application for the development named as 12 Canning Crescent, London comprising 9 apartments falling under the requirements of Haringey Council.

It sets out the design approach with regards to energy, carbon dioxide emissions, and sustainability in order to ensure the development complies with:

- National Planning Policy
- The London Plan
- The Haringey Council Local Plan Policy SP4 Working Towards a Low Carbon Haringey Council

The above policies require:

- A minimum 35% CO2 reduction over Part L1 2021 with an aim to achieve zero carbon were feasible
- A 10% CO2 reduction over Part L1 2021 through energy saving measures
- A 20% CO2 reduction from on-site renewable technology sources

The design of the development will incorporate energy efficient building fabric and services in addition to low carbon technology:

- Thermal specification exceeding Part L 2021 notional U-values
- A design which limits air permeability
- A design which limits thermal bridging
- Energy saving building services including low energy lighting, waste - water heat recovery, MVHR to the ground floor units and decentralised mechanical extract fan to the remaining units
- Low carbon Air Source Heat Pumps and Solar PV Panels

This results in an 82% saving in CO2 emissions over Part L building regulations, of which 72% is from low and zero carbon technologies.

2 Existing and Proposed Development

The development site is located on land at 12 Canning Crescent, London. The development proposals are for nine apartments over four storeys.

The development proposals constitute a minor development.

Aspects of the site location, shape, and surroundings (in particular the adjacent buildings), along with any other requirements of planning, use type, and scale will naturally constrain the development proposals in terms of the layout, positioning, and orientation of the proposed development. Subsequently, these constraints will impact on the feasibility of certain renewable technologies (as discussed in Section 4 of this report).

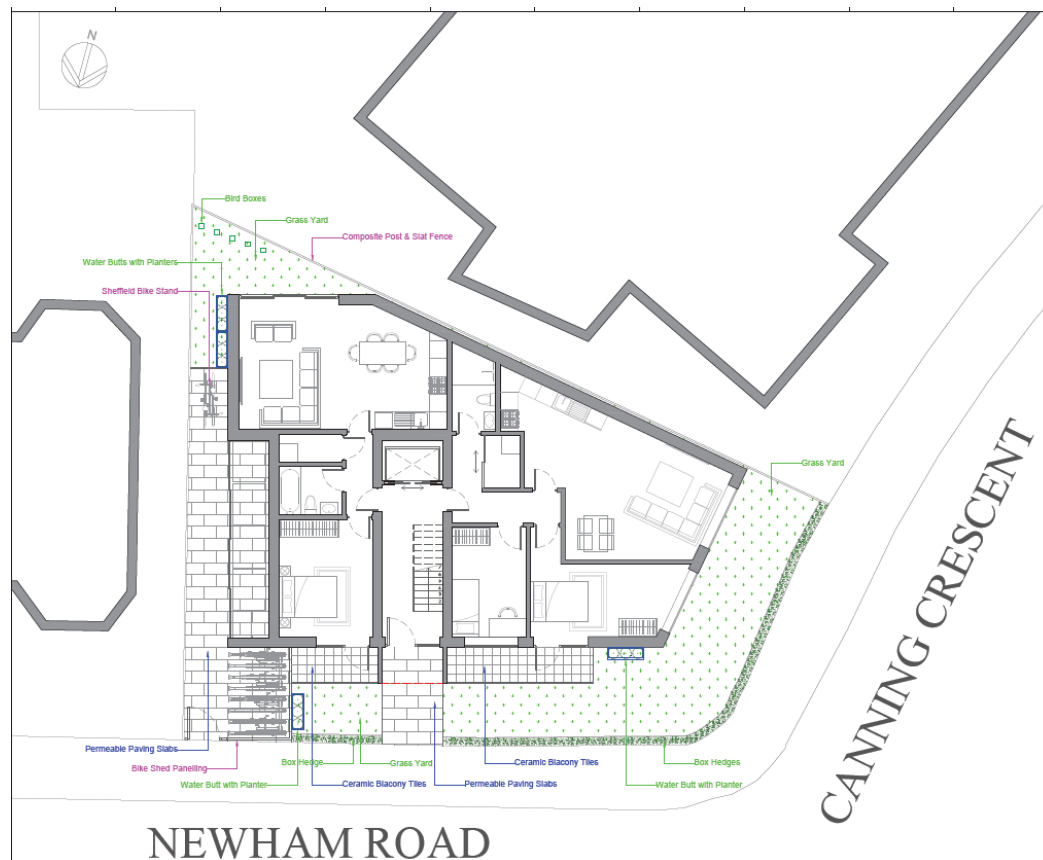


Figure 2.1: Site Location Plan

3 Planning Policy

National Planning Policy Framework 2023

The NPPF was updated in December 2023 to place greater emphasis on beauty, place-making, the environment, and sustainable development. The strengthened environmental objectives aim to protect and enhance the natural, built, and historic environment, and encourage effective land use, greater biodiversity, prudent use of natural resources, minimisation of waste and pollution, and adaptation to climate change alongside a move to a low carbon economy.

Local Planning Policy

The Haringey Local Planning Policy requirements are as follows.

The development should target:

- Haringey Local plan - Policy SP4: Working Towards a Low Carbon Haringey
 - A 20% CO2 reduction from on-site renewable technology sources
- The London Plan Policy SI 2 Minimising greenhouse gas emissions
 - A minimum 35% CO2 reduction over Part L1 2021 with an aim to achieve zero carbon where feasible
 - A 10% CO2 reduction over Part L1 2021 through energy saving measures

4 Methodology

The Standard Assessment Procedure (SAP) is the UK Government methodology for assessing and calculating the energy performance of dwellings.

The Simplified Building Energy Model (SBEM) is the UK Government methodology for assessing and calculating the energy performance of non-domestic buildings.

SAP and SBEM calculations take into account a range of factors that contribute to energy efficiency, including:

- Materials used for the construction and the thermal insulation of the building fabric (u-values¹ and thermal mass)
- Air permeability
- Efficiency, fuel source, and control of heating and cooling systems
- Ventilation system energy use and heat recovery
- Lighting energy
- Low carbon and energy saving or generating technologies

Approved Document Part L of current Building Regulations addresses the conservation of fuel and power. Part L is divided into two separate documents:

- Part L1 Newly constructed and extended or renovated existing dwellings
- Part L2 Newly constructed and extended or renovated existing non-domestic buildings

To comply with Part L, the calculations should demonstrate how the building will either meet or achieve a percentage reduction in the Building Emission Rate (BER) under the required Target Emission Rate (TER).

The calculation software has been used to calculate a baseline of energy demand and carbon dioxide emissions as appropriate from which any reductions or contributions have been measured.

¹ U-values (Thermal Transmittance) - the measure of the overall rate of heat transfer by all mechanisms under standard conditions, through a particular section of a construction. Lower u-values mean better thermal insulation

5 Baseline Energy & CO₂

Energy modelling software has been used to calculate a baseline for the development. This forms the basis from which compliance with planning policy has been measured.

Table 5.1: Baseline CO₂

	CO ₂ Emission Rate (kg CO ₂ /m ² /year)	Floor Area (m ²)	Total Baseline Emissions (kg CO ₂ /year)
Baseline	13.5	623.8	7,684

The **Total Baseline CO₂ Emissions** for the development are shown to be 7,684 kg/year.

6 Low Carbon Design – Fabric First – Be Lean

Before considering low carbon energy generating technology the development has been designed to reduce energy demand through the first step of the energy hierarchy by considering 'fabric first'. A thermally efficient building envelope will follow the design standards as set out below.

Table 6.0: Building Fabric Standards (including u-values W/m²K)

	Part L 2021 Limiting Parameters	Part L 2021 Notional Targets	Proposed Development
Walls	0.26	0.18	0.17
Ground Floor	0.18	0.13	0.1
Roof	0.16	0.11	0.12
Windows	1.6	1.2	1.0 (g-value of 0.4)
Air permeability	8.00	5.00	4

- Insulation: The specified building envelope is designed to exceed the notional Part L targets and will help to limit the energy demand of the dwelling for space heating
- Thermal bridging: The design will seek to limit heat loss through thermal bridging and targeting a global 'y-value' of 0.05

Once heat retention has been addressed the next step is to ensure energy consuming building services are efficient.

- Lighting: Low energy LED lighting throughout with a minimum efficacy of 85 lumens per watt
- Space & Water Heating: Condensing gas boiler 89.5% efficiency for new build baseline OR use same heating system type for conversions
- MVHR to the ground floor units and decentralised mechanical extract fans for the remaining upper floor units
- Shower wastewater heat recovery systems

Table 6.1: Baseline vs Be Lean CO₂

	CO ₂ Emission Rate (kg CO ₂ /m ² /year)	Floor Area (m ²)	Total Baseline Emissions (kg CO ₂ /year)	Reduction in CO ₂
Baseline	13.5	623.8	7,684	N/A
Be Lean	13.2	623.8	6,824 (7,527 minus PV -704)	11%

The **CO₂ Emissions reduction** as a result of energy efficient fabric and services is shown to be 6,824 kg/year which is 11% saving. The notional PV for the dwelling is -1082.

7 Low Carbon Technology Review & Recommendations

Having set out an energy efficient design, the next step is to incorporate low carbon technology for energy generation. A number of technologies exist and should be specified where they:

- Comply with planning policy
- Are feasible for the site
- Are cost efficient
- Are appropriate for proposed development form and function
- Protect against fuel poverty
- Promote fuel security
- Reduce reliance on fossil fuels
- Reduce carbon emissions
- Reduce resource depletion
- Reduce pollution

Site location and development form and function will influence the suitability of different technologies through:

- Orientation
- Space (inside and outside of the buildings)
- Surrounding topography, structures, and natural features
- Wind speed
- Overshading
- Geology and ground conditions
- Building form, function, and density

In determining the most feasible renewable technologies for the dwelling, the following have been reviewed:

- Wind turbines
- Ground Source Heat Pumps
- Air Source Heat Pumps
- Biomass
- Combined Heat and Power
- Photovoltaic Panels
- Solar water heating

WIND TURBINES

Wind turbines are used to produce electricity. They can be either pole mounted (in a suitably exposed position) or building mounted; building mounted systems need a sufficient wind speed at the structural height and both a structural survey and planning permission.

- Wind speed can be too low on low rise buildings
- Taller systems need sufficient space
- Wind resources very variable and unpredictable
- May need planning permission

Wind turbines technology is **not recommended** for this development

GROUND SOURCE HEAT PUMP (GSHP)

GSHPs use naturally occurring underground low-level heat in areas with appropriate geological features. Heat is transferred from the ground by either extracting and discharging (re-charging) water from/to the ground directly (open loop) or circulating water through pipes buried within the ground, (closed loop). The water is passed through a heat pump to transfer the heat from this water into a higher temperature water circuit to provide heating. The loop can be fitted horizontally (laid in a shallow trench) or vertically (in a borehole).

- Feasibility analysis is costly
- Suitable ground conditions required
- More capital intensive than air source heat pumps
- Can be more efficient and lower running costs than ASHPs
- Well suited to highly insulated buildings

Ground source heat pump technology is **not recommended** for this development

AIR SOURCE HEAT PUMP (ASHP)

ASHP systems absorb heat from outside air at a low temperature into a fluid which is then passed through an electrically driven compressor where its temperature is increased. There are two main types of ASHP systems: Air to Water systems distribute heat through wet central heating; Air to air produce warm air which is circulated by fans. For an ASHP system to be installed, there needs to be ample outdoor space for the external condensing unit; these units can also be noisy and blow out colder air to the neighbouring environment.

- Requires space for external plant and internal hot water tank for wet systems supplying DHW
- Can generate noise though quieter systems have been developed
- Least efficient when most needed
- Longer life than fossil fuel boilers
- High capital costs vs gas systems but lower than GSHPs
- Well suited to highly insulated buildings

Air source heat pump technology **is recommended** for this development

BIOMASS

Biomass systems burn wood pellets, chips, or logs to provide heat in a single room, or to power central heating and hot water boilers. There needs to be ample space available for both the boiler and the storage of fuel. There will also be regular deliveries of fuel and therefore adequate site access is required.

- Carbon emissions are cyclical unlike fossil fuel
- Requires fuel storage space and bulk delivery
- Carbon 'neutral' fuel in isolation but supply side emissions are still present so not neutral overall
- Harmful particulate emissions impact air quality and health

Biomass technology **is not recommended** for this development

COMBINED HEAT AND POWER (CHP)

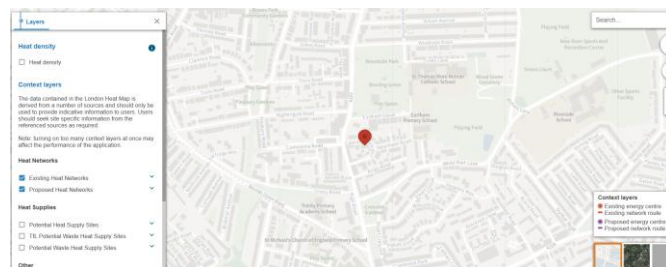
CHP is effectively an on-site small power plant providing both electrical power and thermal heat energy. It is an energy efficiency and low carbon measure rather than a renewable energy technology. A CHP system operates by burning a primary fuel (normally natural gas) by use of either a reciprocating engine or turbine, which in turn drives an alternator to generate electrical power. The heat emitted by the engine and exhaust gases is recovered and used to heat the building or to provide hot water.

- Reduces consumption of and reliance on grid electricity
- Works best with high and consistent heat and hot water demand
- Recovers waste energy
- Can export to the grid
- Uses fossil fuel
- Emissions on site rather than upstream
- Efficiency is sensitive to sizing

CHP **is not recommended** for this development

DISTRICT HEATING

District Heating systems provide multiple buildings or dwellings with heat and hot water from a central boiler house, or 'energy centre'. The system can provide heating or cooling which is transferred from the energy centre through a network of highly insulated pipes carrying the heated water to each dwelling.



- Economies of scale
- Frees up space in habitable areas of development
- Variety of systems
- Can make use of waste heat from industry
- Can be fossil fuel based and dependent

With reference to the Local Heat Map it has been determined that there are no existing or proposed heat networks or energy centres within a suitable radius from the development and there are no existing networks local to the site (See Appendix X)

District heating **is not recommended** for this development

SOLAR PHOTOVOLTAIC (PV)

Solar PV cells (which are mounted together in panels or tiles on the roof) convert sunlight into electricity. The cells are made from layers of semi-conducting material; when the light shines on the cell, an electric field is created across the layers. Although PV cells are most effective in bright sunlight, they can still generate electricity on a cloudy day. The power of a PV cell is measured in kilowatts peak (kWp). Each PV panel produces 250 Watts to 420 Watts depending on the manufacture.

- Passive technology, requires no energy input from grid
- Does not require sunny days to generate power
- Capital costs can be high although payback is effective
- Needs sufficient roof space and orientation
- Zero site or upstream emissions
- Can export to the grid

Solar PV technology **is recommended** for this development

SOLAR HOT WATER

Solar hot water systems absorb energy from the sun and transfer this energy using heat exchangers to heat water which can then be stored. Systems should be roof mounted and oriented to face between a south-east and south-west direction.

- Mostly passive technology but requires pump energy
- Not suitable for combi boilers and developments without roof space
- Lower CO₂ reductions than other technologies

Solar hot water technology **is not recommended** for this development

Low and Zero Carbon Technology Summary

The low carbon technology review indicates that ASHP and Solar PV would be potentially feasible. The following low carbon technology is recommended:

ASHP, air to water assumed Mitsubishi Ecodan PUZ per dwelling, this will need to be checked with an installer.

Solar PV at 10.8 kWp horizontal angle, this will need to be checked with an installer.

This technology is deemed optimal for meeting the needs of the development and achieving policy compliance. It has been incorporated into the energy model and the results are presented in the next section.

8 Low Carbon Technology – Renewable Energy Generation - Be Green

The selected Low Carbon Technology has been incorporated into the calculation and the results are set out below.

Table 8.1: Baseline vs Be Green CO₂

	CO ₂ Emission Rate (kg CO ₂ /m ² /year)	Floor Area (m ²)	Total Baseline Emissions (kg CO ₂ /year)	Reduction in CO ₂
Baseline	13.5	623.8	7,684	N/A
Be Lean & Green Design	2.5	623.8	1,413	82%

The **CO₂ Emissions reduction** as a result of energy efficient fabric and services is shown to be 000 kg/year.

Table 8.2: Baseline vs Be Green Energy Demand

	Energy Demand (kWh/m ² /year)	Floor Area (m ²)	Total Baseline Energy Demand (kWh/year)	Reduction in Energy Demand
Baseline	72.9	623.8	65,369	N/A
Be Lean & Green Design	29.89	623.8	26,901	59%

The **Energy Demand reduction** as a result of energy efficient fabric and services is shown to be 26,901 kWh per year

Table 5.2: Fabric Energy Efficiency

	Fabric Energy Efficiency (kWh/m ² /year)
Baseline	32.3
Be Lean	27.4

9 Conclusion

Proposals are for the development named as 12 Canning Crescent comprising 9 apartments falling under the requirements of 12 Canning Crescent, London.

Under the local planning policy the proposed development is required to achieve a 35% saving in CO₂ emissions over Part L building regulations and to be zero carbon were feasible.

Energy modelling software has been used to calculate a baseline against which compliance with the above can be measured.

The proposed development will be designed to limit energy demand through the inclusion of a thermally efficient building fabric and energy efficient services.

Low carbon technology will be incorporated and is to comprise ASHP and solar PV panels along with a mix of mechanical ventilation with heat recovery and decentralised mechanical extract fans.

This results in an 82% saving in CO₂ emissions over Part L building regulations, of which 70% is from low and zero carbon technologies.

This Energy Statement and the calculations on which it is based demonstrate that the proposed development complies with the local planning policy requirements.

10 Appendix 1

Full SAP Calculation Printout



Plot Reference	ES Rev1				Issued on Date	19/06/2026	
Assessment Reference	Flat 1 - Be Green			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	90 B		DER	2.60		TER	16.28
Environmental	98 A		% DER < TER				84.03
CO ₂ Emissions (t/year)	0.1		DFEE	33.45		TFEE	39.97
Compliance Check	See BREL		% DFEE < TFEE				16.31
% DPER < TPER	61.34		DPER	33.73		TPER	87.25
Assessor Details	Mr. Peter Kinsella				Assessor ID	L770-0002	
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)
Main dwelling			
Ground floor	50.0000 (1b)	2.5000 (2b)	125.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0000 (5)

2. Ventilation rate

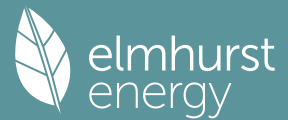
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	1 * 10 = 10.0000 (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)	10.0000 / (5) = 0.0800 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2800 (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) = 0.2800 (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)
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	0.3570	0.3500	0.3430	0.3080	0.3010	0.2660	0.2660	0.2590	0.2800	0.3010	0.3150	0.3290 (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	0.6070	0.6000	0.5930	0.5580	0.5510	0.5160	0.5160	0.5090	0.5300	0.5510	0.5650	0.5790 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K					
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K					
Window			10.7100	0.9615	10.2981		(27)					
Heatloss Floor 1			50.0000	0.1000	5.0000		(28a)					
External Wall 1	56.5000	10.7100	45.7900	0.1700	7.7843		(29a)					
Total net area of external elements Aum(A, m2)			106.5000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.0824		(33)					
Main dwelling												
Party Wall 1			30.5000	0.0000	0.0000		(32)					
Party Ceiling 1			50.0000				(32b)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (User defined value 0.050 * total exposed area)							5.3250 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	28.4074 (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

Full SAP Calculation Printout



(38)m	25.0388	24.7500	24.4613	23.0175	22.7287	21.2850	21.2850	20.9963	21.8625	22.7287	23.3063	23.8838 (38)
Heat transfer coeff	53.4461	53.1574	52.8686	51.4249	51.1361	49.6924	49.6924	49.4036	50.2699	51.1361	51.7136	52.2911 (39)
Average = Sum(39)m / 12 =												51.3527
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0689	1.0631	1.0574	1.0285	1.0227	0.9938	0.9938	0.9881	1.0054	1.0227	1.0343	1.0458 (40)
HLP (average)												1.0271
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6901 (42)
Hot water usage for mixer showers	65.6962	64.7089	63.2702	60.5176	58.4862	56.2208	54.9332	56.3610	57.9261	60.3584	63.1702	65.4444 (42a)
Hot water usage for baths	22.7244	22.3869	21.9117	21.0354	20.3792	19.6517	19.2587	19.7306	20.2445	21.0230	21.9173	22.6476 (42b)
Hot water usage for other uses	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383 (42c)
Average daily hot water use (litres/day)												110.6736 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	120.3589	117.8727	114.7974	110.0071	106.1582	102.0038	100.3232	103.3843	106.6247	110.9969	115.8644	120.0304 (44)
Energy conte	190.6191	167.8492	176.4393	150.5942	142.9093	125.4256	121.3322	128.0114	131.4789	150.6218	165.0701	187.9385 (45)
Energy content (annual)										Total = Sum(45)m =		1838.2897
Distribution loss (46)m = 0.15 x (45)m	28.5929	25.1774	26.4659	22.5891	21.4364	18.8138	18.1998	19.2017	19.7218	22.5933	24.7605	28.1908 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0206 (55)
Total storage loss	31.6386	28.5768	31.6386	30.6180	31.6386	30.6180	31.6386	31.6386	30.6180	31.6386	30.6180	31.6386 (56)
If cylinder contains dedicated solar storage	31.6386	28.5768	31.6386	30.6180	31.6386	30.6180	31.6386	31.6386	30.6180	31.6386	30.6180	31.6386 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	245.5201	217.4372	231.3403	203.7242	197.8103	178.5556	176.2332	182.9124	184.6089	205.5228	218.2001	242.8395 (62)
WWHRS	-38.1457	-33.7363	-35.3267	-29.2519	-27.2618	-23.3281	-21.8664	-23.2527	-24.1361	-28.4538	-32.2347	-37.4393 (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	207.3744	183.7009	196.0136	174.4723	170.5486	155.2276	154.3669	159.6597	160.4728	177.0689	185.9653	205.4003 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2130.2712 (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	107.3016	95.4803	102.5869	92.5766	91.4381	84.2080	84.2638	86.4846	86.2207	94.0025	97.3898	106.4104 (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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.3743	82.3430	74.3743	76.8534	74.3743	76.8534	74.3743	74.3743	76.8534	74.3743	76.8534	74.3743 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040 (71)
Water heating gains (Table 5)	144.2226	142.0837	137.8856	128.5786	122.9007	116.9556	113.2578	116.2427	119.7510	126.3475	135.2636	143.0247 (72)
Total internal gains	414.1824	421.5400	405.5231	390.4989	371.9954	358.8053	346.1319	347.5891	357.4266	369.7403	391.4820	406.4881 (73)

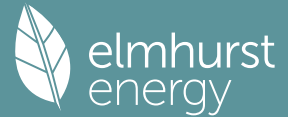
6. Solar gains

[Jan]												
			Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W	
North			3.7800	10.6334		0.4000		0.0000		0.7700	12.3798 (74)	
East			6.9300	19.6403		0.4000		0.0000		0.7700	41.9210 (76)	
Solar gains	54.3008	105.6648	175.2542	261.5403	328.3766	340.2274	322.1957	271.0569	205.4071	125.4697	67.5426	44.7942 (83)
Total gains	468.4832	527.2047	580.7773	652.0391	700.3721	699.0327	668.3276	618.6459	562.8337	495.2100	459.0246	451.2823 (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	64.9668	65.3197	65.6764	67.5203	67.9015	69.8743	69.8743	70.2827	69.0716	67.9015	67.1433	66.4017
alpha	5.3311	5.3546	5.3784	5.5014	5.5268	5.6583	5.6583	5.6855	5.6048	5.5268	5.4762	5.4268
util living area	0.9844	0.9699	0.9344	0.8257	0.6511	0.4521	0.3268	0.3666	0.5999	0.8753	0.9672	0.9867 (86)
Living	20.0613	20.2496	20.5116	20.8162	20.9571	20.9955	20.9994	20.9989	20.9797	20.7841	20.3981	20.0533

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Non living	18.9612	19.1996	19.5231	19.8897	20.0324	20.0862	20.0883	20.0929	20.0669	19.8686	19.4061	18.9656
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5198	20.2496	20.5116	20.8162	20.9571	20.9955	20.9994	20.9989	20.9797	20.7841	20.3981	20.1857 (87)
Th 2	20.0263	20.0310	20.0358	20.0597	20.0644	20.0885	20.0885	20.0933	20.0788	20.0644	20.0549	20.0453 (88)
util rest of house												
	0.9799	0.9615	0.9167	0.7875	0.5945	0.3890	0.2593	0.2947	0.5265	0.8369	0.9565	0.9828 (89)
MIT 2	19.6017	19.1996	19.5231	19.8897	20.0324	20.0862	20.0883	20.0929	20.0669	19.8686	19.4061	19.1601 (90)
Living area fraction									FLA = Living area / (4) =			0.5520 (91)
MIT	20.1085	19.7792	20.0688	20.4011	20.5429	20.5881	20.5912	20.5930	20.5708	20.3740	19.9536	19.7262 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1085	19.7792	20.0688	20.4011	20.5429	20.5881	20.5912	20.5930	20.5708	20.3740	19.9536	19.7262 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9803	0.9589	0.9174	0.8021	0.6240	0.4237	0.2965	0.3344	0.5663	0.8507	0.9552	0.9812 (94)
Useful gains	459.2638	505.5270	532.7970	523.0033	437.0418	296.1988	198.1894	206.8774	318.7565	421.2584	438.4537	442.8102 (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	844.9023	790.9398	717.3628	591.4430	452.1901	297.5649	198.3338	207.1515	325.2852	499.8029	664.7083	811.8850 (97)
Space heating kWh	286.9151	191.7974	137.3170	49.2766	11.2703	0.0000	0.0000	0.0000	0.0000	58.4371	162.9033	274.5916 (98a)
Space heating requirement - total per year (kWh/year)												1172.5084
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	286.9151	191.7974	137.3170	49.2766	11.2703	0.0000	0.0000	0.0000	0.0000	58.4371	162.9033	274.5916 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1172.5084
Space heating per m2										(98c) / (4) =		23.4502 (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 %)												275.1380 (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	286.9151	191.7974	137.3170	49.2766	11.2703	0.0000	0.0000	0.0000	0.0000	58.4371	162.9033	274.5916 (98)
Space heating efficiency (main heating system 1)	275.1380	275.1380	275.1380	275.1380	275.1380	0.0000	0.0000	0.0000	0.0000	275.1380	275.1380	275.1380 (210)
Space heating fuel (main heating system)	104.2804	69.7095	49.9084	17.9098	4.0962	0.0000	0.0000	0.0000	0.0000	21.2392	59.2078	99.8014 (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	207.3744	183.7009	196.0136	174.4723	170.5486	155.2276	154.3669	159.6597	160.4728	177.0689	185.9653	205.4003 (64)
Efficiency of water heater (217)m	191.9713	191.9713	191.9713	191.9713	191.9713	191.9713	191.9713	191.9713	191.9713	191.9713	191.9713	191.9713 (216)
Fuel for water heating, kWh/month	108.0236	95.6918	102.1057	90.8846	88.8406	80.8598	80.4114	83.1685	83.5920	92.2372	96.8714	106.9953 (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	1.1916	1.0763	1.1916	1.1532	1.1916	1.1532	1.1916	1.1916	1.1532	1.1916	1.1532	1.1916 (231)
Lighting	17.7044	14.2032	12.7884	9.3693	7.2371	5.9128	6.6019	8.5815	11.1465	14.6248	16.5186	18.1965 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-15.0350	-25.3294	-43.6576	-55.9634	-65.1329	-62.4555	-61.3315	-54.9826	-43.8766	-31.1588	-17.5466	-12.3752 (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	-3.5352	-9.5071	-24.9094	-47.7166	-72.0012	-75.7845	-73.6599	-57.1531	-35.6114	-15.9811	-5.2630	-2.6238 (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												426.1528 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												191.9713
Water heating fuel used												1109.6820 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans: (MEVDecentralised, Database: total watage = 0.7360, total flow = 8.0000, SFP = 0.0920)												14.0300 (230a)
mechanical ventilation fans (SFP = 0.0920)												14.0300 (231)
Total electricity for the above, kWh/year												142.8850 (232)
Electricity for lighting (calculated in Appendix L)												

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-912.5914 (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	780.1584 (238)

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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	426.1528	0.1572	66.9856 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1109.6820	0.1406	156.0182 (264)
Space and water heating			223.0037 (265)
Pumps, fans and electric keep-hot	14.0300	0.1387	1.9461 (267)
Energy for lighting	142.8850	0.1443	20.6227 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-488.8451	0.1319	-64.5011
PV Unit electricity exported	-423.7462	0.1206	-51.1013
Total			-115.6024 (269)
Total CO2, kg/year			129.9703 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.6000 (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	426.1528	1.5819	674.1250 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1109.6820	1.5199	1686.5639 (278)
Space and water heating			2360.6888 (279)
Pumps, fans and electric keep-hot	14.0300	1.5128	21.2246 (281)
Energy for lighting	142.8850	1.5338	219.1618 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-488.8451	1.4875	-727.1613
PV Unit electricity exported	-423.7462	0.4424	-187.4676
Total			-914.6288 (283)
Total Primary energy kWh/year			1686.4464 (286)
Dwelling Primary energy Rate (DPER)			33.7300 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	50.0000 (1b)	2.5000 (2b)	125.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0000 (5)

2. Ventilation rate

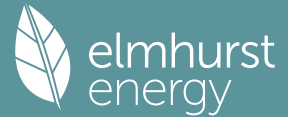
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) =	20.0000 / (5) = 0.1600 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4100 (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) = 0.4100 (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	0.5228	0.5125	0.5023	0.4510	0.4408	0.3895	0.3895	0.3793	0.4100	0.4408	0.4613	0.4818 (22b)
Effective ac	0.6366	0.6313	0.6261	0.6017	0.5971	0.5759	0.5759	0.5719	0.5840	0.5971	0.6064	0.6160 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling			10.7100	1.1450	12.2634		(27)
TER Opening Type							

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Heatloss Floor 1				50.0000	0.1300	6.5000	(28a)
External Wall 1	56.5000	10.7100		45.7900	0.1800	8.2422	(29a)
Total net area of external elements Aum(A, m2)				106.5000			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =		27.0056	(33)
Main dwelling							
Party Wall 1			30.5000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)

List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				5.1000	0.0500	0.2550	
E3 Sill				5.1000	0.0500	0.2550	
E4 Jamb				8.4000	0.0500	0.4200	
E5 Ground floor (normal)				22.6000	0.1600	3.6160	
E16 Corner (normal)				10.0000	0.0900	0.9000	
E17 Corner (inverted - internal area greater than external area)				7.5000	-0.0900	-0.6750	
E18 Party wall between dwellings				7.5000	0.0600	0.4500	
P1 Party wall - Ground floor				12.2000	0.0800	0.9760	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.1970 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 33.2026 (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	26.2611	26.0423	25.8278	24.8201	24.6316	23.7540	23.7540	23.5915	24.0921	24.6316	25.0130	25.4117	(38)
Average = Sum(39)m / 12 =	59.4637	59.2448	59.0303	58.0227	57.8342	56.9566	56.9566	56.7941	57.2946	57.8342	58.2156	58.6143	(39)
												58.0218	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1893	1.1849	1.1806	1.1605	1.1567	1.1391	1.1391	1.1359	1.1459	1.1567	1.1643	1.1723	(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													1.6901 (42)
Hot water usage for mixer showers													
Hot water usage for baths	52.5569	51.7671	50.6162	48.4141	46.7890	44.9767	43.9465	45.0888	46.3409	48.2867	50.5361	52.3556	(42a)
Hot water usage for other uses	22.7244	22.3869	21.9117	21.0354	20.3792	19.6517	19.2587	19.7306	20.2445	21.0230	21.9173	22.6476	(42b)
Average daily hot water use (litres/day)	31.9383	30.7769	29.6155	28.4541	27.2927	26.1314	26.1314	27.2927	28.4541	29.6155	30.7769	31.9383	(42c)
												98.5597	(43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	107.2197	104.9310	102.1434	97.9036	94.4609	90.7597	89.3366	92.1121	95.0395	98.9252	103.2304	106.9415	(44)
Energy content (annual)	169.8097	149.4203	156.9906	134.0251	127.1626	111.5996	108.0448	114.0541	117.1932	134.2406	147.0706	167.4445	(45)
Distribution loss (46)m = 0.15 x (45)m	25.4715	22.4130	23.5486	20.1038	19.0744	16.7399	16.2067	17.1081	17.5790	20.1361	22.0606	25.1167	(46)

Water storage loss (or HIU loss): 150.0000 (47)

Store volume 1.3938 (48)

a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)

Temperature factor from Table 2b 0.7527 (55)

Enter (49) or (54) in (55)													
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

WWHRS	216.4047	191.5060	203.5855	179.1170	173.7575	156.6915	154.6398	160.6490	162.2850	180.8355	192.1624	214.0394	(62)
PV diverter	-24.0268	-21.2495	-22.2513	-18.4249	-17.1714	-14.6937	-13.7730	-14.6462	-15.2026	-17.9222	-20.3037	-23.5819	(63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
	192.3778	170.2565	181.3342	160.6920	156.5861	141.9978	140.8668	146.0028	147.0824	162.9133	171.8587	190.4575	(64)
												1962.4258	(64)

12Total per year (kWh/year) 1962 (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 92.9512 (65)

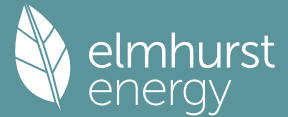
5. Internal gains (see Table 5 and 5a)

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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	74.3743	82.3430	74.3743	76.8534	74.3743	76.8534	74.3743	74.3743	76.8534	74.3743	76.8534	74.3743	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Pumps, fans	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(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)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Total internal gains	125.9915	124.0340	120.2625	111.9956	106.9321	101.6394	98.3882	101.0738	104.2225	110.0953	118.0201	124.9344	(72)
	398.9512	406.4902	390.9000	376.9159	359.0268	343.4890	331.2624	332.4201	341.8981	356.4881	377.2384	391.3978	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2		Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W	
North	3.7800		10.6334		0.6300		0.7000		0.7700		12.2839	(74)
East	6.9300		19.6403		0.6300		0.7000		0.7700		41.5961	(76)

Solar gains	53.8800	104.8459	173.8960	259.5133	325.8317	337.5906	319.6987	268.9562	203.8152	124.4973	67.0192	44.4470	(83)
Total gains	452.8312	511.3361	564.7960	636.4292	684.8585	681.0797	650.9611	601.3763	545.7133	480.9854	444.2576	435.8449	(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	58.3923	58.6080	58.8210	59.8425	60.0375	60.9626	60.9626	61.1371	60.6029	60.0375	59.6442	59.2385	
alpha	4.8928	4.9072	4.9214	4.9895	5.0025	5.0642	5.0642	5.0758	5.0402	5.0025	4.9763	4.9492	
util living area	0.9882	0.9777	0.9519	0.8711	0.7196	0.5245	0.3831	0.4308	0.6786	0.9114	0.9765	0.9901	(86)
MIT	19.8387	20.0330	20.3214	20.6840	20.9036	20.9843	20.9974	20.9954	20.9463	20.6507	20.1973	19.8187	(87)
Th 2	19.9286	19.9321	19.9355	19.9518	19.9548	19.9690	19.9690	19.9716	19.9635	19.9548	19.9487	19.9422	(88)
util rest of house	0.9846	0.9709	0.9375	0.8362	0.6579	0.4447	0.2943	0.3364	0.5939	0.8783	0.9682	0.9870	(89)
MIT 2	18.6079	18.8547	19.2143	19.6522	19.8810	19.9609	19.9682	19.9701	19.9310	19.6290	19.0765	18.5927	(90)
Living area fraction										FLA = Living area / (4) =		0.5520	(91)
MIT	19.2873	19.5051	19.8254	20.2218	20.4455	20.5258	20.5363	20.5361	20.4914	20.1930	19.6952	19.2695	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2873	19.5051	19.8254	20.2218	20.4455	20.5258	20.5363	20.5361	20.4914	20.1930	19.6952	19.2695	(93)

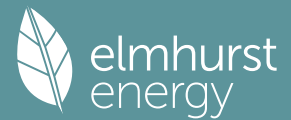
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9817	0.9676	0.9357	0.8460	0.6879	0.4883	0.3434	0.3886	0.6386	0.8868	0.9657	0.9844	(94)
Useful gains	444.5664	494.7667	528.4945	538.3915	471.1351	332.5797	223.5326	233.6876	348.4724	426.5523	429.0283	429.0491	(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	891.2003	865.2781	786.6040	656.9196	505.7865	337.5137	224.1988	234.9038	366.1946	554.8030	733.2359	883.2851	(97)
Space heating kWh	332.2956	248.9836	192.0335	85.3402	25.7807	0.0000	0.0000	0.0000	0.0000	95.4185	219.0294	337.9516	(98a)
Space heating requirement - total per year (kWh/year)												1536.8332	
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	332.2956	248.9836	192.0335	85.3402	25.7807	0.0000	0.0000	0.0000	0.0000	95.4185	219.0294	337.9516	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1536.8332	
Space heating per m2										(98c) / (4) =		30.7367	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													92.3000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	332.2956	248.9836	192.0335	85.3402	25.7807	0.0000	0.0000	0.0000	0.0000	95.4185	219.0294	337.9516	(98)	
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)	
Space heating fuel (main heating system)	360.0169	269.7548	208.0536	92.4596	27.9314	0.0000	0.0000	0.0000	0.0000	103.3787	237.3017	366.1448	(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	192.3778	170.2565	181.3342	160.6920	156.5861	141.9978	140.8668	146.0028	147.0824	162.9133	171.8587	190.4575	(64)	
Efficiency of water heater (217)m	85.2737	84.9109	84.1886	82.7076	80.9600	79.8000	79.8000	79.8000	79.8000	82.9035	84.6048	85.3312	(216)	
Fuel for water heating, kWh/month	225.6004	200.5118	215.3905	194.2893	193.4118	177.9421	176.5248	182.9609	184.3137	196.5094	203.1312	223.1979	(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	15.4535	12.3974	11.1625	8.1781	6.3170	5.1610	5.7626	7.4904	9.7293	12.7654	14.4185	15.8830	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-11.1921	-16.8465	-25.8399	-31.0770	-35.3301	-33.6673	-33.2748	-30.5088	-25.9534	-20.1438	-12.6829	-9.5569	(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)	-3.4499	-7.4639	-15.2240	-23.4433	-31.5633	-31.9060	-31.5140	-26.4090	-19.0125	-10.8429	-4.6606	-2.7119	(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													1665.0414	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)

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Efficiency of water heater	79.8000	
Water heating fuel used	2373.7838	(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)	124.7187	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-494.2751	(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	3755.2688	(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	1665.0414	0.2100	349.6587 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2373.7838	0.2100	498.4946 (264)
Space and water heating			848.1533 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	124.7187	0.1443	18.0008 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-286.0736	0.1332	-38.1102
PV Unit electricity exported	-208.2015	0.1252	-26.0640
Total			-64.1742 (269)
Total CO2, kg/year			813.9092 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.2800 (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	1665.0414	1.1300	1881.4968 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2373.7838	1.1300	2682.3757 (278)
Space and water heating			4563.8725 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	124.7187	1.5338	191.2976 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-286.0736	1.4923	-426.8999
PV Unit electricity exported	-208.2015	0.4595	-95.6659
Total			-522.5658 (283)
Total Primary energy kWh/year			4362.7052 (286)
Target Primary Energy Rate (TPER)			87.2500 (287)