

Energy Statement

Mount Pleasant

Job number: 13116

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1	23/07/2025	BL	PK	Updated site location & figures

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1 Executive Summary

This report has been produced by Base Energy on behalf of Sunbright Property Ltd and in support of the planning application for the development named as Mount Pleasant, Bury comprising the construction of a new residential development consisting of seven houses, falling under the requirements of Greater Manchester Authority.

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 Greater Manchester Combined Authority
- Places for everyone joint development plan, JP-S2 Carbon and Energy

The above policies require:

- Be Net Zero Carbon where feasible

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

- Thermal specification meeting and exceeding Part L 2021 notional U-values
- A design which limits air permeability, targeting 3.0
- A design which limits thermal bridging
- Energy saving building services including low energy lighting, wastewater heat recovery, heating controls, heat recovery ventilation
- Solar PV Panels totalling 4.8 kWp / dwelling

This results in an overall 83% carbon emissions reduction over Part L 2021.

2 Existing and Proposed Development

The development site is located on land at Mount Pleasant, Simister, Manchester.

The development proposals are for the construction of 7 new build terrace houses, five are three storey and two over two 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).



3 Planning Policy

National Planning Policy Framework 2025

The NPPF was updated in February 2025 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.

The Greater Manchester Combined Authority

The relevant Local Planning Policy requirements are as follows.

- Places for everyone joint development plan, JP-S2 Carbon and Energy

The development should target:

- Be Net Zero Carbon where feasible
 - From adoption to regulated operational carbon emissions
 - From 2028 to all emissions in construction
- As an interim measure, development should be consistent with 2022 Part L building regulations (this would be the current Part L 2021)
- From 2025 development should also calculate and minimise carbon emissions from unregulated emissions alongside regulated emissions.

Development proposals should set out how this has been achieved in an energy statement in accordance with the energy hierarchy.

- Achieve energy demand reductions in terms of space heat demand; hot water energy demand and the delivery of on-site renewable energy generation, in accordance with Table 5.1.
- Solar PV is required where feasible to meet 20% of the ground floor area
- Include a detailed energy statement to demonstrate via site relevant evidence how the development has sought to maximize reductions in carbon emissions in line with relevant policy targets, including the minimisation of overheating risks and appropriate measures for post occupancy evaluation. Whole life cycle emissions should be considered where possible.

Based on the above the property is aiming to meet a saving in CO2 and energy over Part L 2021 building regulations.

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

	CO₂ Emission Rate (kg CO₂/m²/year)	Floor Area (m²)	Total Baseline Emissions (kg CO₂/year)
Baseline	10.2	300	3060

The **Total Baseline CO₂ Emissions** for the development are shown to be 3,060 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 Notional Targets	Proposed Development
Walls	0.18	0.15
Ground Floor	0.13	0.11
Roof	0.11	0.11
Windows	1.2	1.2
Doors	1.0	1.0
Air permeability	5.00	3.00

- Insulation: The specified building envelope is designed to exceed the notional and limiting 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 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 80 lumens per watt
- Space & Water Heating: Condensing gas boiler 89.5% efficiency
- Heating Controls: Comprising programmer, thermostat, and TRVs
- Ventilation: Mechanical ventilation with heat recovery
- Wastewater heat recovery system in the form of a Recoup Pipe+ HE (61.5% efficiency & 0.975 Utilisation factor)

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 Carbon Technology Summary

The low carbon technology review indicates that Air Source Heat Pump and Solar PV would be potentially feasible. The following low carbon technology is recommended:

Solar PV: 4.8 kWp at 45° with none or little overshadowing (plot type A: west/east facing & Plot type B: southwest/northeast facing)

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	10.2	300	3060	N/A
Be Lean & Green Design	1.7	300	510	83%

The **CO₂ Emissions reduction** as a result of energy efficient fabric and services is shown to be 2,550 kg/year which equals a 83% reduction.

9 Conclusion

Proposals are for the development named as Mount Pleasant comprising the construction of 7 new build dwellings, consisting of two different types falling under the requirements of the Greater Manchester combined authority.

Under the local planning policy, the proposed development is required to achieve a saving in CO₂ via renewable energy over Part L 2021 building regulations.

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.

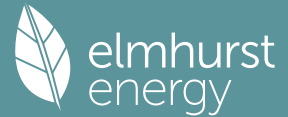
Low carbon technology will be incorporated and is to comprise solar PV at 4.8 kWp / dwelling, split on both sides of the pitch roof.

This results in a 83% saving in CO₂ emissions over Part L 2021 regulations.

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 Be Green DER/TER SAP Worksheets**

Full SAP Calculation Printout



Property Reference	13116 1				Issued on Date	23/07/2025	
Assessment Reference	BeGreen			Prop Type Ref	3B5P House		
Property	Mount Pleasant, Simister, Greater Manchester, M25 2SD						
SAP Rating	87 B	DER	2.05	TER	10.44		
Environmental	98 A	% DER < TER				80.36	
CO ₂ Emissions (t/year)	0.25	DFEE	31.92	TFEE	34.72		
Compliance Check	See BREL	% DFEE < TFEE				8.07	
% DPER < TPER	37.28	DPER	34.21	TPER	54.55		
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	40.7000 (1b)	x 2.4500 (2b)	= 99.7150 (1b) - (3b)
First floor	40.7000 (1c)	x 2.7000 (2c)	= 109.8900 (1c) - (3c)
Second floor	28.6000 (1d)	x 2.6200 (2d)	= 74.9320 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 284.5370 (5)

2. Ventilation rate

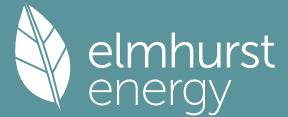
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												80.1000 (23c)
Effective ac	0.2764	0.2729	0.2695	0.2521	0.2487	0.2313	0.2313	0.2278	0.2382	0.2487	0.2556	0.2625 (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
Main dwelling							
Windows			13.8000	1.1450	15.8015		(27)
External door			2.1000	1.0000	2.1000		(26)
Rooflight			1.4500	1.1450	1.6603		(27a)
Ground floor			40.7000	0.1100	4.4770	110.0000	(28a)
External Wall	109.3500	14.8200	94.5300	0.1500	14.1795	110.0000	10398.3000 (29a)
Dormer walls	5.6200	1.0800	4.5400	0.1500	0.6810	9.0000	40.8600 (29a)
External Pitch Roof	32.9900	1.4500	31.5400	0.1100	3.4694	9.0000	283.8600 (30)
Dormer roof	2.4300		2.4300	0.1100	0.2673	9.0000	21.8700 (30)
Cold pitch roof / flat ceiling	12.1000		12.1000	0.1100	1.3310	9.0000	108.9000 (30)
Total net area of external elements A _{um} (A, m ²)			203.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.9670		(33)
Main dwelling							
Party Wall			64.0300	0.0000	0.0000	110.0000	7043.3000 (32)

Full SAP Calculation Printout



Internal Floor 1	40.7000	18.0000	732.6000 (32d)
Internal Floor 2	27.9400	18.0000	502.9200 (32d)
Internal Ceiling 1	40.7000	9.0000	366.3000 (32e)
Internal Ceiling 2	40.0400	9.0000	360.3600 (32e)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 24336.2700 (34)
 Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 221.2388 (35)
 Thermal bridges (User defined value 0.050 * total exposed area) 10.1595 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 54.1265 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.9538	25.6281	25.3024	23.6738	23.3481	21.7196	21.7196	21.3939	22.3710	23.3481	23.9995	24.6510	(38)
Heat transfer coeff	80.0803	79.7546	79.4289	77.8004	77.4747	75.8461	75.8461	75.5204	76.4975	77.4747	78.1261	78.7775	(39)
Average = $\text{Sum}(39)m / 12 =$												77.7189	
HLP	0.7280	0.7250	0.7221	0.7073	0.7043	0.6895	0.6895	0.6865	0.6954	0.7043	0.7102	0.7162	(40)
HLP (average)												0.7065	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8148 (42)
Hot water usage for mixer showers	98.1959	96.7202	94.5698	90.4555	87.4192	84.0331	82.1085	84.2426	86.5820	90.2176	94.4203	97.8197	(42a)
Hot water usage for baths	30.8341	30.3762	29.7313	28.5423	27.6520	26.6648	26.1315	26.7719	27.4691	28.5254	29.7389	30.7298	(42b)
Hot water usage for other uses	43.4566	41.8764	40.2962	38.7159	37.1357	35.5554	35.5554	37.1357	38.7159	40.2962	41.8764	43.4566	(42c)
Average daily hot water use (litres/day)												158.6274	(43)
Daily hot water use	172.4866	168.9727	164.5973	157.7137	152.2068	146.2533	143.7954	148.1501	152.7670	159.0391	166.0356	172.0061	(44)
Energy conte	273.1766	240.6149	252.9799	215.9021	204.8996	179.8355	173.9081	183.4408	188.3769	215.8146	236.5482	269.3200	(45)
Energy content (annual)										Total = $\text{Sum}(45)m =$		2634.8174	
Distribution loss (46)m = 0.15 x (45)m	40.9765	36.0922	37.9470	32.3853	30.7349	26.9753	26.0862	27.5161	28.2565	32.3722	35.4822	40.3980	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.9600	(55)
Total storage loss	29.7600	26.8800	29.7600	28.8000	29.7600	28.8000	29.7600	29.7600	28.8000	29.7600	28.8000	29.7600	(56)
If cylinder contains dedicated solar storage	29.7600	26.8800	29.7600	28.8000	29.7600	28.8000	29.7600	29.7600	28.8000	29.7600	28.8000	29.7600	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	302.9366	267.4949	282.7399	244.7021	234.6596	208.6355	203.6681	213.2008	217.1769	245.5746	265.3482	299.0800	(62)
WWHRS	-76.2976	-67.4782	-70.6593	-58.5087	-54.5280	-46.6600	-43.7363	-46.5092	-48.2762	-56.9124	-64.4748	-74.8847	(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	226.6390	200.0167	212.0805	186.1934	180.1316	161.9755	159.9318	166.6916	168.9007	188.6622	200.8734	224.1953	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = $\text{Sum}(64)m =$		2276.2918	(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) = $\text{Sum}(64a)m =$												0.0000	(64a)
Heat gains from water heating, kWh/month	114.6392	101.5085	107.9238	94.8275	91.9371	82.8353	81.6325	84.8021	85.6753	95.5664	101.6923	113.3569	(65)

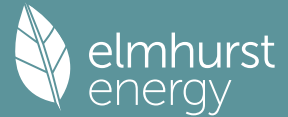
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	140.7413	140.7413	140.7413	140.7413	140.7413	140.7413	140.7413	140.7413	140.7413	140.7413	140.7413	140.7413	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.6395	162.3509	146.6395	151.5275	146.6395	151.5275	146.6395	146.6395	151.5275	146.6395	151.5275	146.6395	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	271.5560	274.3739	267.2729	252.1557	233.0729	215.1377	203.1560	200.3381	207.4391	222.5563	241.6391	259.5743	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0741	37.0741	37.0741	37.0741	37.0741	37.0741	37.0741	37.0741	37.0741	37.0741	37.0741	37.0741	(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)	-112.5930	-112.5930	-112.5930	-112.5930	-112.5930	-112.5930	-112.5930	-112.5930	-112.5930	-112.5930	-112.5930	-112.5930	(71)
Water heating gains (Table 5)	154.0850	151.0543	145.0589	131.7048	123.5714	115.0490	109.7210	113.9813	118.9935	128.4494	141.2393	152.3614	(72)
Total internal gains	637.5029	653.0015	624.1937	600.6104	568.5062	546.9367	524.7389	526.1813	543.1825	562.8677	599.6283	623.7976	(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
East				5.6000	19.6403		0.6300	0.7000		0.7700		33.6130 (76)
West				8.2000	19.6403		0.6300	0.7000		0.7700		49.2190 (80)
West				1.4500	26.2379		0.6300	0.7000		1.0000		15.1001 (82)
Solar gains	97.9321	192.3472	318.7293	467.9936	576.3840	591.3001	562.4199	481.2003	371.7128	228.7477	122.2472	80.4474 (83)
Total gains	735.4350	845.3487	942.9230	1068.6040	1144.8902	1138.2368	1087.1588	1007.3816	914.8954	791.6154	721.8755	704.2450 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	84.4162	84.7609	85.1085	86.8900	87.2553	89.1288	89.1288	89.5132	88.3698	87.2553	86.5278	85.8123
alpha	6.6277	6.6507	6.6739	6.7927	6.8170	6.9419	6.9419	6.9675	6.8913	6.8170	6.7685	6.7208
util living area	0.9914	0.9779	0.9392	0.8103	0.6191	0.4258	0.3069	0.3447	0.5713	0.8797	0.9779	0.9932 (86)
MIT	20.2877	20.4640	20.6879	20.9112	20.9863	20.9991	20.9999	20.9998	20.9940	20.8712	20.5533	20.2674 (87)
Th 2	20.3162	20.3188	20.3214	20.3344	20.3370	20.3501	20.3501	20.3527	20.3449	20.3370	20.3318	20.3266 (88)
util rest of house												
	0.9891	0.9726	0.9258	0.7797	0.5781	0.3829	0.2616	0.2963	0.5193	0.8501	0.9717	0.9915 (89)
MIT 2	19.4820	19.7060	19.9830	20.2493	20.3261	20.3496	20.3501	20.3527	20.3409	20.2141	19.8305	19.4646 (90)
Living area fraction												
MIT	19.5992	19.8162	20.0855	20.3455	20.4221	20.4441	20.4446	20.4468	20.4359	20.3096	19.9357	19.5813 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5992	19.8162	20.0855	20.3455	20.4221	20.4441	20.4446	20.4468	20.4359	20.3096	19.9357	19.5813 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9861	0.9678	0.9205	0.7802	0.5835	0.3891	0.2682	0.3033	0.5266	0.8488	0.9672	0.9889	(94)
Useful gains	725.2442	818.1373	867.9169	833.7650	668.0063	442.8611	291.5752	305.5636	481.8027	671.8999	698.1728	696.4387	(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	1225.1646	1189.6396	1079.0841	890.4671	675.7410	443.2495	291.5982	305.6159	484.6817	752.2512	1002.7997	1211.7026	(97)
Space heating kWh	371.9408	249.6495	157.1084	40.8255	5.7546	0.0000	0.0000	0.0000	0.0000	59.7814	219.3314	383.3564	(98a)
Space heating requirement - total per year (kWh/year)												1487.7480	
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	371.9408	249.6495	157.1084	40.8255	5.7546	0.0000	0.0000	0.0000	0.0000	59.7814	219.3314	383.3564	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1487.7480	
Space heating per m2										(98c) / (4) =		13.5250	(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 %)												100.0000 (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	371.9408	249.6495	157.1084	40.8255	5.7546	0.0000	0.0000	0.0000	0.0000	59.7814	219.3314	383.3564 (98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)	371.9408	249.6495	157.1084	40.8255	5.7546	0.0000	0.0000	0.0000	0.0000	59.7814	219.3314	383.3564 (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	226.6390	200.0167	212.0805	186.1934	180.1316	161.9755	159.9318	166.6916	168.9007	188.6622	200.8734	224.1953 (64)	
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)	
Fuel for water heating, kWh/month	226.6390	200.0167	212.0805	186.1934	180.1316	161.9755	159.9318	166.6916	168.9007	188.6622	200.8734	224.1953 (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	29.8512	26.9624	29.8512	28.8883	29.8512	28.8883	29.8512	29.8512	28.8883	29.8512	28.8883	29.8512 (231)	
Lighting	31.1041	24.9529	22.4673	16.4605	12.7146	10.3879	11.5987	15.0764	19.5827	25.6936	29.0209	31.9686 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-56.2912	-88.5078	-139.3666	-161.1751	-176.5939	-166.2534	-163.6812	-151.7623	-128.1969	-100.9943	-63.6298	-47.2415 (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	-17.7861	-45.3579	-113.1364	-208.3442	-303.6558	-314.8315	-307.3347	-244.5588	-160.2453	-77.0620	-26.3238	-13.3044 (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													1487.7480 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													100.0000
Water heating fuel used													2276.2918 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.0125)													
mechanical ventilation fans (SFP = 1.0125)													351.4743 (230a)
Total electricity for the above, kWh/year													351.4743 (231)
Electricity for lighting (calculated in Appendix L)													251.0282 (232)

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

PV generation	-3275.6349 (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	1090.9074 (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	1487.7480	0.1579	234.9419 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2276.2918	0.1409	320.7948 (264)
Space and water heating			555.7367 (265)
Pumps, fans and electric keep-hot	351.4743	0.1387	48.7538 (267)
Energy for lighting	251.0282	0.1443	36.2311 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1443.6940	0.1336	-192.8183
PV Unit electricity exported	-1831.9409	0.1216	-222.6733
Total			-415.4917 (269)
Total CO2, kg/year			225.2300 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.0500 (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	1487.7480	1.5846	2357.4400 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2276.2918	1.5211	3462.4771 (278)
Space and water heating			5819.9171 (279)
Pumps, fans and electric keep-hot	351.4743	1.5128	531.7104 (281)
Energy for lighting	251.0282	1.5338	385.0355 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1443.6940	1.4936	-2156.2564
PV Unit electricity exported	-1831.9409	0.4460	-817.0292
Total			-2973.2856 (283)
Total Primary energy kWh/year			3763.3774 (286)
Dwelling Primary energy Rate (DPER)			34.2100 (287)

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

1. Overall dwelling characteristics

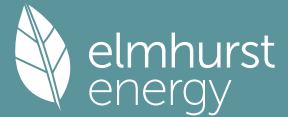
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	40.7000 (1b)	x 2.4500 (2b)	= 99.7150 (1b) - (3b)
First floor	40.7000 (1c)	x 2.7000 (2c)	= 109.8900 (1c) - (3c)
Second floor	28.6000 (1d)	x 2.6200 (2d)	= 74.9320 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	110.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	284.5370 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1406 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3906 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3613 (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	0.4606	0.4516	0.4426	0.3974	0.3884	0.3432	0.3432	0.3342	0.3613	0.3884	0.4064	0.4245 (22b)

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Effective ac 0.6061 0.6020 0.5979 0.5790 0.5754 0.5589 0.5589 0.5558 0.5653 0.5754 0.5826 0.5901 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type			13.8000	1.1450	15.8015			(27)
TER Roof Window			1.4500	1.1450	2.1805			(27a)
Ground floor			40.7000	0.1300	5.2910			(28a)
External Wall	109.3500	14.8200	94.5300	0.1800	17.0154			(29a)
Dormer walls	5.6200	1.0800	4.5400	0.1800	0.8172			(29a)
External Pitch Roof	32.9900	1.4500	31.5400	0.1100	3.4694			(30)
Dormer roof	2.4300		2.4300	0.1100	0.2673			(30)
Cold pitch roof / flat ceiling	12.1000		12.1000	0.1100	1.3310			(30)
Total net area of external elements Aum(A, m2)			203.1900					(31)
Fabric heat loss, W/K = Sum (A x U)					48.2733			(33)
Main dwelling								
Party Wall			64.0300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 221.2388 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	10.1300	0.0500	0.5065	
E3 Sill	9.1300	0.0500	0.4565	
E4 Jamb	23.9000	0.0500	1.1950	
E5 Ground floor (normal)	18.0500	0.1600	2.8880	
E6 Intermediate floor within a dwelling	36.1000	0.0000	0.0000	
E16 Corner (normal)	15.5400	0.0900	1.3986	
E18 Party wall between dwellings	15.5400	0.0600	0.9324	
R1 Head of roof window	1.0000	0.0800	0.0800	
R2 Sill of roof window	1.0000	0.0600	0.0600	
R3 Jamb of roof window	2.9000	0.0800	0.2320	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.7490 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 56.0223 (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	56.9106	56.5237	56.1446	54.3636	54.0304	52.4792	52.4792	52.1919	53.0767	54.0304	54.7045	55.4092	(38)
Heat transfer coeff													
	112.9328	112.5460	112.1668	110.3859	110.0526	108.5015	108.5015	108.2142	109.0990	110.0526	110.7267	111.4315	(39)
Average = Sum(39)m / 12 =													110.3843

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0267	1.0231	1.0197	1.0035	1.0005	0.9864	0.9864	0.9838	0.9918	1.0005	1.0066	1.0130	(40)
HLP (average)												1.0035	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8148 (42)
Hot water usage for mixer showers													
	71.4152	70.3420	68.7780	65.7858	63.5776	61.1150	59.7153	61.2673	62.9687	65.6128	68.6693	71.1416	(42a)
Hot water usage for baths													
	30.8341	30.3762	29.7313	28.5423	27.6520	26.6648	26.1315	26.7719	27.4691	28.5254	29.7389	30.7298	(42b)
Hot water usage for other uses													
	43.4566	41.8764	40.2962	38.7159	37.1357	35.5554	35.5554	37.1357	38.7159	40.2962	41.8764	43.4566	(42c)
Average daily hot water use (litres/day)													133.9365 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	145.7059	142.5945	138.8055	133.0440	128.3652	123.3352	121.4022	125.1749	129.1537	134.4344	140.2846	145.3280	(44)
Energy conte	230.7625	203.0527	213.3389	182.1306	172.8043	151.6550	146.8255	154.9926	159.2594	182.4262	199.8612	227.5486	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													2224.6574
	34.6144	30.4579	32.0008	27.3196	25.9206	22.7483	22.0238	23.2489	23.8889	27.3639	29.9792	34.1323	(46)

Water storage loss: 250.0000 (47)

Store volume 1.8903 (48)

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

Enter (49) or (54) in (55) 1.0208 (55)

Total storage loss

31.6444 28.5820 31.6444 30.6236 31.6444 30.6236 31.6444 31.6444 30.6236 31.6444 30.6236 31.6444 31.6444 (56)

If cylinder contains dedicated solar storage

31.6444 28.5820 31.6444 30.6236 31.6444 30.6236 31.6444 31.6444 30.6236 31.6444 30.6236 31.6444 31.6444 (57)

Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 (59)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month

285.6693 252.6459 268.2457 235.2662 227.7111 204.7906 201.7322 209.8994 212.3950 237.3329 252.9968 282.4554 (62)

WWHRS -32.6480 -28.8742 -30.2354 -25.0361 -23.3327 -19.9660 -18.7149 -19.9015 -20.6576 -24.3530 -27.5890 -32.0434 (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

253.0213 223.7717 238.0103 210.2301 204.3783 184.8246 183.0173 189.9980 191.7374 212.9799 225.4078 250.4119 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2567.7886 (64)

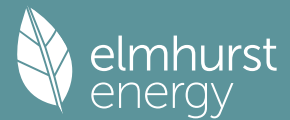
Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

Heat gains from water heating, kWh/month 120.6540 107.1896 114.8606 103.0669 101.3828 92.9338 92.7449 95.4605 95.4622 104.5821 108.9623 119.5853 (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	140.7413	140.7413	140.7413	140.7413	140.7413	140.7413	140.7413	140.7413	140.7413	140.7413	140.7413	140.7413	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	146.6395	162.3509	146.6395	151.5275	146.6395	151.5275	146.6395	146.6395	151.5275	146.6395	151.5275	146.6395	(67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	271.5560	274.3739	267.2729	252.1557	233.0729	215.1377	203.1560	200.3381	207.4391	222.5563	241.6391	259.5743 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0741	37.0741	37.0741	37.0741	37.0741	37.0741	37.0741	37.0741	37.0741	37.0741	37.0741	37.0741 (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)	-112.5930	-112.5930	-112.5930	-112.5930	-112.5930	-112.5930	-112.5930	-112.5930	-112.5930	-112.5930	-112.5930	-112.5930 (71)
Water heating gains (Table 5)	162.1693	159.5083	154.3825	143.1485	136.2673	129.0747	124.6571	128.3071	132.5864	140.5674	151.3366	160.7330 (72)
Total internal gains	648.5873	664.4556	636.5174	615.0541	584.2021	560.9623	539.6750	540.5071	556.7755	577.9856	612.7256	635.1692 (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	
East				5.6000	19.6403	0.6300	0.7000		0.7700		33.6130 (76)	
West				8.2000	19.6403	0.6300	0.7000		0.7700		49.2190 (80)	
West				1.4500	26.2379	0.6300	0.7000		1.0000		15.1001 (82)	
Solar gains	97.9321	192.3472	318.7293	467.9936	576.3840	591.3001	562.4199	481.2003	371.7128	228.7477	122.2472	80.4474 (83)
Total gains	746.5194	856.8028	955.2467	1083.0477	1160.5861	1152.2624	1102.0949	1021.7074	928.4883	806.7334	734.9728	715.6165 (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	59.8592	60.0650	60.2680	61.2404	61.4258	62.3040	62.3040	62.4694	61.9628	61.4258	61.0519	60.6658
alpha	4.9906	5.0043	5.0179	5.0827	5.0951	5.1536	5.1536	5.1646	5.1309	5.0951	5.0701	5.0444
util living area	0.9941	0.9874	0.9702	0.9096	0.7793	0.5842	0.4299	0.4810	0.7385	0.9436	0.9875	0.9952 (86)
MIT	19.7427	19.9375	20.2299	20.6128	20.8684	20.9765	20.9960	20.9930	20.9257	20.5764	20.1024	19.7215 (87)
Th 2	20.0612	20.0641	20.0670	20.0804	20.0829	20.0947	20.0947	20.0969	20.0902	20.0829	20.0778	20.0725 (88)
util rest of house	0.9924	0.9839	0.9617	0.8850	0.7277	0.5089	0.3431	0.3897	0.6649	0.9228	0.9834	0.9938 (89)
MIT 2	18.5955	18.8451	19.2151	19.6897	19.9723	20.0807	20.0933	20.0941	20.0388	19.6587	19.0663	18.5767 (90)
Living area fraction	18.7624	19.0040	19.3627	19.8240	20.1026	20.2110	20.2246	20.2249	20.1678	19.7922	19.2170	18.7432 (92)
MIT	18.7624	19.0040	19.3627	19.8240	20.1026	20.2110	20.2246	20.2249	20.1678	19.7922	19.2170	18.7432 (92)
Temperature adjustment	18.7624	19.0040	19.3627	19.8240	20.1026	20.2110	20.2246	20.2249	20.1678	19.7922	19.2170	18.7432 (93)
adjusted MIT	18.7624	19.0040	19.3627	19.8240	20.1026	20.2110	20.2246	20.2249	20.1678	19.7922	19.2170	18.7432 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9890	0.9784	0.9534	0.8770	0.7289	0.5189	0.3557	0.4028	0.6717	0.9146	0.9780	0.9909 (94)
Ext temp.	738.2990	838.3276	910.7596	949.8446	845.9428	597.8703	392.0180	411.5831	623.6901	737.8072	718.8370	709.0994 (95)
Heat loss rate W	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)
Space heating kWh	1633.2775	1587.3466	1442.7669	1205.8567	924.7338	608.8054	393.2694	413.9073	661.9953	1011.6222	1341.6751	1620.5721 (97)
Space heating requirement - total per year (kWh/year)	665.8640	503.3408	395.8134	184.3287	58.6205	0.0000	0.0000	0.0000	0.0000	203.7184	448.4434	678.1357 (98a)
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)
Space heating contribution - total per year (kWh/year)	665.8640	503.3408	395.8134	184.3287	58.6205	0.0000	0.0000	0.0000	0.0000	203.7184	448.4434	678.1357 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	203.7184	448.4434	3138.2648 (98c) / (4) =
Space heating per m2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	28.5297 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	92.3000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	665.8640	503.3408	395.8134	184.3287	58.6205	0.0000	0.0000	0.0000	0.0000	203.7184	448.4434	678.1357 (98)
Space heating fuel (main heating system)	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 efficiency (main heating system 2)	721.4128	545.3313	428.8336	199.7061	63.5108	0.0000	0.0000	0.0000	0.0000	220.7134	485.8542	734.7082 (211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	253.0213	223.7717	238.0103	210.2301	204.3783	184.8246	183.0173	189.9980	191.7374	212.9799	225.4078	250.4119 (64)
Efficiency of water heater (217)m	86.1254	85.8212	85.1920	83.7662	81.6444	79.8000	79.8000	79.8000	79.8000	83.9602	85.5717	79.8000 (216)
Fuel for water heating, kWh/month	293.7826	260.7417	279.3810	250.9723	250.3275	231.6098	229.3450	238.0927	240.2725	253.6678	263.4139	290.5724 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	30.4688	24.4432	22.0084	16.1243	12.4549	10.1757	11.3617	14.7684	19.1827	25.1688	28.4281	31.3156 (232)

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Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-39.5070	-56.4450	-82.1881	-93.6140	-101.9212	-95.4301	-94.2135	-88.4532	-78.4642	-65.0589	-43.6840	-34.0659	(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	-20.0858	-42.4985	-84.9420	-128.2836	-170.3352	-171.4533	-169.4772	-143.2023	-104.5468	-61.0573	-26.9043	-15.8681	(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												3400.0702	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												3082.1791	(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)												245.9007	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2011.6995	(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												4802.4505	(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	3400.0702	0.2100	714.0148	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3082.1791	0.2100	647.2576	(264)
Space and water heating			1361.2724	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	245.9007	0.1443	35.4911	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-873.0449	0.1343	-117.2717	
PV Unit electricity exported	-1138.6546	0.1257	-143.1597	
Total			-260.4314	(269)
Total CO2, kg/year			1148.2613	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.4400	(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	3400.0702	1.1300	3842.0794	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3082.1791	1.1300	3482.8624	(278)
Space and water heating			7324.9417	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	245.9007	1.5338	377.1707	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-873.0449	1.4964	-1306.4487	
PV Unit electricity exported	-1138.6546	0.4615	-525.4848	
Total			-1831.9336	(283)
Total Primary energy kWh/year			6000.2796	(286)
Target Primary Energy Rate (TPER)			54.5500	(287)