

ENVIRONMENTAL STANDARDS STATEMENT

LAND AT OLD MARKET STREET

PROPERTY ADDRESS

**LAND AT OLD MARKET ST
CRUMPSALL**

DATE

January 2025

PREPARED BY

EAL Consult

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1.EXECUTIVE SUMMARY

Site description

This Energy and Sustainability Assessment has been prepared to support the planning application for the erection of a block of 9 flats and a block of 11 flats, for a total of 20 new residential units.

Strategy

The strategy highlights how the proposed development will promote sustainability throughout both design and operation and responds to the UK Planning and regulatory framework, National Planning Policy Framework 2023 and Manchester's Local Plan Strategic Policies, summarising how the relevant targets will be addressed and achieved.

Energy Hierarchy

In accordance with the Energy Hierarchy, this statement outlines an overall commitment to reducing energy consumption under occupancy through the adoption of a 'Fabric First' principle, which will seek to enhance insulation standards and improved heating and lighting efficiencies in comparison to the standard requirements of Approved Document Part L 2021. The viability of district heating will be explored. Further carbon emission reduction will be achieved by using renewable technologies.

- **Be 'Lean':** Passive design principles including a high level of insulation and reduced air permeability to deliver Part L compliant Building in absence of renewable technologies. It will achieve an average **17%** reduction in carbon emissions over Part L 2021 baseline.
- **Be 'Clean':** district heating was deemed not viable for this project
- **Be 'Green':** Air Source Heat Pumps have been proposed for the specific scheme and will deliver a further average **60%** reduction in regulated carbon emissions over Part L 2021 baseline

Energy Efficiency & Carbon Reduction

- This report demonstrates that the proposed development by incorporating the measures above can achieve an **overall** average carbon emission reduction of **77%**

Overheating

The development proposal will minimise adverse impacts on the urban heat island through design, layout, orientation and materials.

Ventilation

The development utilises natural ventilation in the building.

Sustainable Design:

- Natural lighting is incorporated to prevent excessive demand for artificial lighting
- The development will not increase the air pollution of the area
- Total internal water consumption will not exceed 105 litres/person/day
- All contractors should sign up to the nationally recognised Considerate Constructors Scheme
- Designated space for waste and recycling facilities
- Low Flood Risk area

Reducing Waste and Supporting the Circular Economy:

- Minimising the use of virgin materials during construction by recycling and reusing where feasible.
- Promote a more circular economy that improves resource efficiency and innovation to keep products and materials at their highest use for as long as possible
- Encourage waste minimisation and waste prevention through the reuse of materials and using fewer resources in the production and distribution of products
- Low waste benchmark levels will be targeted during construction with requirements identifying that the diversion of waste from landfill is to be achieved by the contractor.

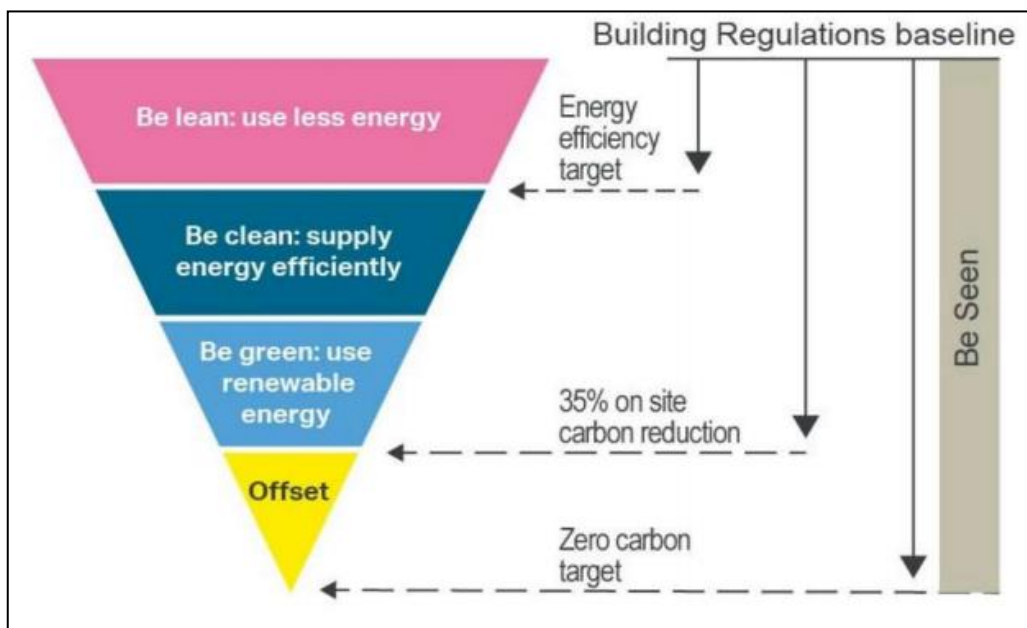
2.METHODOLOGY

This energy assessment outlines the energy demand from the development together with the associated CO₂ emissions, using Building Regulations Part L 2021 as a baseline. It demonstrates how the emissions from energy use in the development will be reduced through energy efficiency measures.

The proposed scheme is required to achieve carbon emission reduction principles in accordance with the UK Planning and regulatory framework.

The methodology employed to determine the potential CO₂ savings is in accordance with the three-step Energy Hierarchy.

Figure 1: The Energy Hierarchy



- **Be 'Lean'** - Improve the energy efficiency of the scheme;
- **Be 'Clean'** - Supply as much of the remaining energy requirement with low carbon; technologies such as district heating if available or combined heat and power (CHP); and
- **Be 'Green'** - Offset a proportion of the remaining carbon dioxide emissions by using renewable technologies.
- **Be 'Seen'** - monitor, verify and report on post-construction energy performance

The government approved Standard Assessment Procedure (SAP) methodology software (2021) has been used to determine the CO₂ emissions and energy requirements. It compares CO₂ emissions from regulated energy use (DER) with those of an equivalent dwelling built to Part L 2021 (TER), a notional dwelling of the same size and shape.

Opportunities for incorporating features into the development that contribute to the objectives of sustainable development were explored during the design process, to ensure that where possible, the proposals achieve best practice.

3. PLANNING POLICY CONTEXT

National Planning Policy Framework (NPPF) 2023

Emphasised the concept of sustainable development by encouraging local authorities to adopt proactive strategies to mitigate and adapt to climate change. It recommends the move to a low carbon future by:

- Avoiding increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and
- Contributing to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.
- To help increase the use and supply of renewable and low carbon energy and heat, plans should:
 - provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
 - consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
 - identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for colocating potential heat customers and suppliers.
- New updates emphasised that when determining planning applications, local planning authorities should give significant weight to the need to support energy efficiency and low carbon heating improvements to existing buildings, both domestic and non-domestic.

Manchester, Core Strategy – 2012 to 2027.

Policy EN4 – Reducing CO2 emissions by enabling low and zero carbon development

The Council will seek to reduce fuel poverty and decouple growth in the economy, growth in CO2 emissions, and rising fossil fuel prices, through the following actions:

- All development must follow the principle of the Energy Hierarchy, being designed:
- to reduce the need for energy through design features that provide passive heating, natural lighting and cooling
- to reduce the need for energy through energy efficient features such as improved insulation and glazing
- to meet residual energy requirements through the use of low or zero carbon energy generating technologies
- Wherever possible new development and retrofit projects, including energy generation plant, must be located and designed in a manner that allows advantage to be taken of opportunities for low and zero carbon energy supplies.
- Where possible new development and retrofit projects will be used as a mechanism to help improve energy efficiency and provide low and zero carbon energy supplies to existing buildings.
- Where appropriate new development and retrofit projects will be required to connect to and/or make contributions to low or zero carbon energy schemes and/or to incorporate provision to enable future connection to any existing / potential decentralised energy schemes.
- The use of building materials with low embodied carbon in new development and refurbishment schemes.

Policy EN6 – Target Framework for CO2 reductions from low or zero carbon energy supplies

Applications for residential development of 10 or more units and all other development over 1,000 sqm will be expected as a minimum to meet the target shown in Tables 12.1 or 12.2, unless this can be shown not to be viable. This should be demonstrated through an energy statement, submitted as part of the Design and Access Statement. Such a statement will be expected to set out the projected regulated energy demand and associated CO2 emissions for all phases of the development.

Developments smaller than the above threshold, but involving the erection of a building or substantial improvement to an existing building will also be expected to meet the minimum target, where viable, but will not be expected to submit an energy statement.

The target framework relates to three broad development locations and their potential for low and zero carbon, decentralised energy. The areas are defined as follows:

- Target 1 Network development areas: Locations where the proximity of new and existing buildings, the mix of uses and density of development provide the right conditions to support district heating (and cooling).
- Target 2 Electricity intense areas: Locations where the predominant building type has an all-electric fit-out such as retail units and leisure complexes.
- Target 3 Micro-generation areas: Locations where lower densities and a fragmented mix of uses tend to mean that only building scale solutions are practical.

Policy EN7 – Energy Infrastructure Opportunities

There will be a general presumption in favour of low and zero carbon decentralised energy schemes, subject to the following considerations:

- That any new generating plant capable of producing heat and cooling as well as electricity should be located in a way that facilitates future connection to a local distributed energy system.
- That any energy centre, including generating plant, standby/boiler plant and substations, shall be located and designed to a high quality so as to integrate with and contribute to the townscape.
- Biofuels should be obtained from sustainable sources and processes and in a way that minimises transport impacts, following a sequential approach in order to minimise CO2 emissions – firstly prioritising local and regional sources, followed by national, European and international.
- Consideration should be given to biofuel delivery by rail and waterways where possible. Where large-scale fuel or feedstock delivery is required by road the energy centre must be located in or adjacent to light industrial, industrial or leisure uses with any impact on local residential amenity minimised.
- The cumulative impact of energy schemes will be taken into account when considering applications, to include modelled impacts on air quality and landscape character, with reference to Policy EN16.
- Flood risk, through the Manchester-Salford-Trafford Strategic Flood Risk Assessment.

Policy EN8 – Adaptation to Climate Change

All new development will be expected to be adaptable to climate change in terms of the design, layout, siting and function of both buildings and associated external spaces. In achieving developments which are adaptable to climate change developers should have regard to the following, although this is not an exhaustive list:

- Minimisation of flood risk by appropriate siting, drainage, and treatment of surface areas to ensure rain water permeability
- Reduction in urban heat island effect through the use of Green Infrastructure such as green roofs, green walls, increased tree cover and waterways
- The need to control overheating of buildings through passive design
- The opportunity to provide linked and diverse green space to enhance natural habitats which will assist species adaptation

4. ENERGY STRATEGY

The Energy strategy for the proposed development is based on the Building Regulations Part L; it adopts a set of principles to guide design and decisions regarding energy, balanced with the need to optimise environmental and economic benefits. It seeks to incorporate energy efficiency through the approach detailed below.

The following tables demonstrate the average carbon emissions and savings.

Table 1. Average Carbon Dioxide emissions after each stage of the Energy Hierarchy

	Regulated Carbon dioxide emissions (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	0.98	
After Energy Demand Reduction (Be Lean)	0.82	
After Heat Network Connection (Be Clean)	0	
After Renewables (Be Green)	0.22	

Table 2. Average Carbon Dioxide Savings from each stage of the Energy Hierarchy

	Regulated Carbon dioxide savings	
	Tonnes CO ₂ per annum	%
Be Lean: Savings from Energy Demand Reduction	0.16	17
Be Clean: Savings from Heat Network	0	0
Be Green: Savings from Renewable Energy	0.59	60
Cumulative on-site savings	0.76	77

a. Baseline Model

A baseline model is run with Building Regulations Part L target values as set out in SAP 10.2 Appendix R. This baseline model is then used in the Energy Strategy process in comparison to the Be 'Lean', Be 'Clean' and Be 'Green' scenarios of the Energy Hierarchy, to establish the regulated CO₂ emissions from the development.

The baseline model used for this project assumed that any heating and hot water supply would be provided by a gas boiler and any active cooling would be provided by electrically powered equipment. The comparative Be 'Lean' model assumes the same heating strategy.

b. Be 'Lean' - Demand Reduction

The building fabric performance and engineering systems have been optimised in order to use less energy prior to the inclusion or consideration of Low and Zero Carbon (LZC) Technology.

Through passive design measures, efficient building fabric and engineering systems the flats are estimated to achieve a **17%** reduction in annual regulated CO₂ emissions over Part L benchmark, therefore demonstrating compliance with Building Regulations Through passive means alone without the utilisation of renewable technologies.

Passive Design Measures

Fabric Performance - The fabric performance values aim to reduce unwanted heat loss and heat gains, whilst maintaining a comfortable internal environment.

The heat loss of different building elements is dependent upon their U –value. A building with low U values provides better levels of insulation and reduced heating demand.

The development will incorporate high levels of insulation and efficient glazing; thereby reduce demand for space heating. The table below shows the U values for the development and the associated improvements over Building Regulations.

Table 3. Energy Efficient Design Specification

Element	Building Regulations 2021 Standard	Specification
Wall	0.18 W/m ² k	0.13 W/m ² k
Roof	0.11 W/m ² k	0.10 W/m ² k
Floor	0.13 W/m ² k	0.10 W/m ² k
Glazing	1.2 W/m ² k	1.0 W/m ² k

Air Permeability – designed to achieve an air permeability score of 2.5

Efficient Lighting and Controls - Throughout the development natural lighting will be optimised. The development will also incorporate low energy light fittings throughout. All light fittings will be specified as low energy lighting and will accommodate LED luminaires only.

Ventilation - The use of natural ventilation is proposed for the dwellings.

Space Heating & Cooling - Space heating will be provided by underfloor heating by the ASHP.

Domestic Hot Water (DHW) system – domestic hot water is supplied for the dwelling via the built in cylinder.

c. Be 'Clean' - Supply Energy Efficiently

The Be Clean step of the energy hierarchy refers to the use of 'Clean energy supply'. This includes, but is not limited to, the use of Combined Heat and Power (CHP) and District Heat Networks.

District Heating and Cooling

There is no existing or planned heat and energy network in the vicinity and the site does not fall into an opportunity area with decentralised energy potential. However, the development will be built ready to accommodate District Heating and Cooling should a local network be introduced in the future.

Community heating and Combined Heat and Power (CHP system)

CHP systems are usually needed where there is a large heat demand (schemes with more than 100-150 dwellings), usually resulting from the building(s) being in continuous use, or through specific heating requirements such as a swimming pool. Community (or district) heating involves using a central boiler plant (or other heat sources) to heat a number of buildings through a network of well-insulated underground pipes. This system is not considered appropriate for this development

In light of the small scale of the proposed development, it is apparent that the use of CHP is also technically and financially unviable in this instance.

Site-wide communal system/network and design for district network connection

In light of the small scale of the proposed development and its location; it is apparent that the use of a heatpump fed site-wide network is technically and financially unviable.

Air Quality

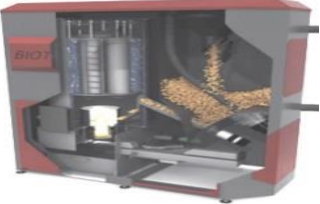
As the heating system proposed for this development is a heat pump it is assumed that this project meets BEB and a full Air Quality Neutral (AQN) Assessment is not required.

d. Be 'Green' - Renewable Energy

Once energy demand reduction measures have been applied, methods for generating low and zero carbon energy can be assessed. The following renewable technologies can be considered for the project: Biomass, Water source heat pump, air source heat pump, Wind energy and solar photovoltaic panels.

Table 4. Renewable Technologies Feasibility Table

Technology	Pros	Cons
Biomass Heating A biomass system designed for wood pellets, which have a high-energy content, would fuel this development.	<ul style="list-style-type: none"> • Less volume of storage • Less maintenance and produce considerably less ash residue 	<ul style="list-style-type: none"> • Nox Emissions which may impact • High Costs • Not suitable for the project

		
<p>Ground Source Heat Pump</p> <p>It circulates a mixture of water and antifreeze around a loop of pipe, called a ground loop, which is buried in the garden. Heat from the ground is absorbed into the fluid and passes through a heat exchanger into the heat pump</p> 	<ul style="list-style-type: none"> • Use all through the year 	<ul style="list-style-type: none"> • High Costs • Not suitable for this project
<p>Air Source Heat Pump</p> <p>They are an efficient and environmentally-friendly way of heating using air drawn freely from the atmosphere. They operate rather like a refrigerator in reverse, absorbing heat from the air into a working fluid which is passed into a compressor where its temperature is increased before it is transferred into the heating and hot water circuits of the building</p>	<ul style="list-style-type: none"> • Can generate less CO₂ than conventional heating systems. • Cheaper • Provides heating and hot water • Less maintenance • Can be used as air-conditioning in the summer 	<ul style="list-style-type: none"> • Needs electricity • Can be noisy
<p>Wind Turbines</p> <p>Wind turbines are available in various sizes from large rotors able to supply whole communities to small roof or wall-mounted units for individual dwellings.</p> 	<ul style="list-style-type: none"> • Cheaper • Less CO₂ 	<ul style="list-style-type: none"> • Local wind speeds in the area is likely to be below the level generally required for investment in large wind turbines. • Noise and signal interference. • Detrimental aesthetic impact
<p>Solar Photovoltaic Panels (PV)</p> <p>Photovoltaic panels extract the energy of the sun to generate electricity. They operate most efficiently when oriented to the south and are inclined to about 35 degrees.</p>	<ul style="list-style-type: none"> • Cheaper • Less CO₂ • No input power in order to generate electricity. 	

			
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Renewable Technologies Feasibility Review Conclusion

The renewable energy sources that have been reviewed for this project are Biomass Heating, Ground Source Heat Pump, Air Source Heat Pump, Domestic Wind Turbine and Solar Photovoltaic Panels (PV).

On review of the above technologies, it has been concluded that the use of air source heat pumps are to be incorporated in the design because their inclusion leads to an average CO₂ percentage reduction of **60%** contributing to an overall reduction of **77%** in carbon emissions.

5.SUSTAINABILITY STRATEGY

a. Sustainable Design

The proposed project incorporates sustainable design and construction measures capable of mitigating and adapting to climate change to meet future needs. This section details site-specific initiatives which demonstrate how the conversion helps to meet the sustainability objectives set out in the National Planning Framework 2023.

Materials Efficiency

Materials can have a significant impact on environmental performance, both in construction but also ongoing use. Materials used for the building will have lower environmental impacts over their lifecycle. This applies to the materials used in the external walls, roof and glazing. This extends to elements of the materials category such as the basic building materials (internal walls) and the finishing elements (fascia, skirting, and furniture).

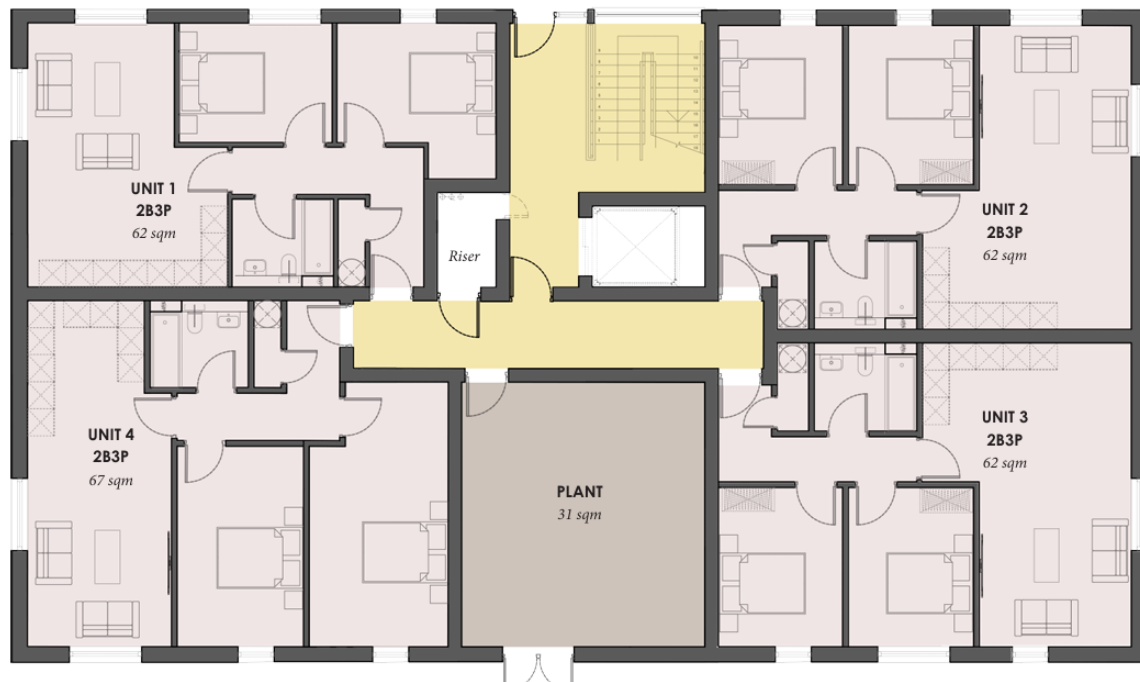
b. Overheating Strategy

Minimise Heat Generation Through Energy Efficient Design

Through the use of passive and active design measures, the design team have enabled the development to require less energy through the use of optimised insulation, cross ventilation, improved window u-values, higher air tightness and reduced cold bridging.

Daylight

The design of the development has taken into consideration day lighting to habitable spaces to improve the wellbeing of occupants. Good levels of daylight will offer occupants a pleasant and highly valued connection to the outdoors and plenty of natural light. It will also reduce the use of artificial lighting and therefore energy use. All light fittings will be specified as low energy lighting. No external lighting is required. The location and orientation of windows help to create a design that avoids overheating in the summer.

Figure 2. Internal layout

c. Water Efficiency

Water: Water Efficiency

In domestic and non-domestic buildings, the demand for water can be reduced as much as 50% using a variety of simple and innovative strategies that are integrated into the plumbing and mechanical systems. In order to reduce water consumption the proposed development will include efficient fixtures with low flow rates. Total internal water consumption will not exceed 105 litres/person/day.

Table 5. Water Fittings Standards

Schedule Appliance Water Consumption		
Appliance	Flow rate or Capacity	Total Litres
WC	Dual flush WC 4/2.6 litre	14.72
Basin	1.7 litres/min	5.98
Shower	8 litres/minute flow	24.00
Bath	160 litres	25.60
Sink	4 litres/min	14.13
W/machine	Default used	16.66
Dish Washer	Default used	3.90
		104.99

d. Pollution: Light, Air and Noise

Light

Light pollution can best be described as artificial light that is allowed to illuminate or intrude upon areas not intended to be lit. Light in the wrong place at the wrong time can be intrusive.

Intrusive light is over bright or poorly directed lights shining onto neighbouring property which affect the neighbours' right to enjoy their property. Therefore, the proposal will incorporate lighting measures in order to avoid causing a nuisance.

Air and Noise

The layout of the development can provide good internal air quality for habitable areas but not too much so as to waste heat.

The use of openable windows will create horizontal airflow. By achieving a good naturally ventilated building the energy demand for air conditioning and mechanical ventilation will thereby be eliminated within the development.

The development will not increase the air pollution of the area by reducing as a start, its energy use, which in turn will reduce emissions that lead to air pollution.

Other measures will include:

- a. Use of eco-friendly building materials
- b. Non-toxic paints
- c. Installation of energy efficient appliances and devices
- d. Use of renewable technologies

e. Waste Management

Considerate Construction

All contractors would be required to sign up to the nationally recognised Considerate Constructors Scheme which requires, amongst other things that dust emissions, potential noise pollution, impacts on water quality and the potential for ground contamination are minimised during demolition and construction. The Contractor would also be obliged to adhere to a site-specific Code of Construction Practice to reduce potential nuisance effects.

Diversion of waste from landfill

- Where possible, segregation of recyclable and non-recyclable material will be employed for all waste generated throughout the construction process. Furthermore, material will be re-used on-site where feasible;
- Pre-fabrication of materials/elements such as bathroom pods, pipework and riser materials will be considered;
- Reusable packing solutions with key product manufacturers will be explored at the earliest opportunity. Solutions may include flat pallets, bulk bags, steel stillages and returnable cable drums;
- Construction waste – minimum 80% diversion from landfill rate;
- Demolition waste – minimum 90% diversion from landfill rate;

Operational Waste

A space for reuse and recycling has been included at the ground floor unit for the residents exclusive use.

f. Flood Risk

The development site is located in a Low Flood Risk Area on the Environment Agency Flood Risk Map.

g. Sustainable Procurement

It is expected that all timber used in the development will come from a legal Source (FSC Scheme). At least 80% of the building materials will be responsibly sourced and will use suppliers who can provide an EMS certificate or equivalent. Materials rated with an A or B in the BRE Green Guide to Specification will be preferred.

Other measures will be implemented:

- The reuse of existing materials from the demolition of existing buildings
- At least 20% of the total value of materials used should derive from recycled and reused content in the products and materials selected;
- Steel will have a high recycled content;
- Concrete will have a Ground Granulated Blast Furnace Slag (GGBS) value of 50%.

6. CONCLUSION

The development has been designed to exceed Part L building regulations requirements. In line with the national and local policies, regulated CO₂ emissions from the development will be reduced by **77%** from the notional emissions once energy efficiency measures and lean measures are taken into account.

The use of air source heat pumps are to be incorporated in the design because they achieve an average CO₂ percentage reduction of **60%** contributing to the overall reduction of **77%** in carbon emissions. The remainder is made up from a fabric first approach with U-values outlined in the specification column of Table 3 on Page 10 of this report.

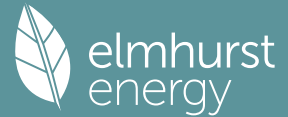
An appraisal of the proposed development has been undertaken against key sustainability objectives identified from relevant policy guidance. The framework for the appraisal was guided by the National Plan. This process has ensured that the development responds to the sustainable development objectives that are relevant to the area. Key sustainability initiatives in ecology, waste management, water, health and wellbeing, materials, pollution and Surface water management have been incorporated in the design of the proposed Development.

7. APPENDIX

A. SAP Calculations

i. Baseline

Full SAP Calculation Printout



Property Reference	Baseline			Issued on Date	06/01/2025
Assessment Reference	FF-Unit 5 (Block A)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	84 B	DER	15.21	TER	10.97
Environmental	89 B	% DER < TER			-38.65
CO ₂ Emissions (t/year)	0.88	DFEE	20.54	TFEE	19.03
Compliance Check	See BREL	% DFEE < TFEE			-7.93
% DPER < TPER	-46.28	DPER	84.96	TPER	58.08
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	60.4500 (1b)	2.4000 (2b)	145.0800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.4500		145.0800 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	145.0800 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1379 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3879 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3297 (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	0.4203	0.4121	0.4039	0.3626	0.3544	0.3132	0.3132	0.3050	0.3297	0.3544	0.3709	0.3874 (22b)
Effective ac	0.5883	0.5849	0.5815	0.5658	0.5628	0.5490	0.5490	0.5465	0.5543	0.5628	0.5688	0.5750 (25)

3. Heat losses and heat loss parameter

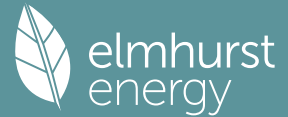
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.20)			11.1100	1.1450	12.7214		(27)
External Wall	38.1400	11.1100	27.0300	0.1800	4.8654	70.0000	1892.1000 (29a)
Total net area of external elements A _{um} (A, m ²)			38.1400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.5868		(33)
Party Wall			38.1400	0.0000	0.0000	180.0000	6865.2000 (32)
Party Floor			60.4500			40.0000	2418.0000 (32d)
Party Ceiling			60.4500			30.0000	1813.5000 (32b)
Internal Wall			98.7800			9.0000	889.0200 (32c)

Heat capacity C_m = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13877.8200 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 229.5752 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.0000	0.3000	1.8000
E3 Sill	3.2000	0.0400	0.1280
E4 Jamb	21.8000	0.0500	1.0900
E7 Party floor between dwellings (in blocks of flats)	27.7900	0.0700	1.9453
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	31.7800	0.0000	0.0000
E18 Party wall between dwellings	4.8000	0.0600	0.2880
E9 Balcony between dwellings, wall insulation continuous	3.0000	0.0200	0.0600

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E16 Corner (normal)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss

2.4000
0.0900
0.2160
5.5273 (36)
0.0000
(33) + (36) + (36a) = 23.1141 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m
Heat transfer coeff
Average = Sum(39)m / 12 =

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8483	0.8456	0.8430	0.8304	0.8281	0.8172	0.8172	0.8152	0.8214	0.8281	0.8328	0.8378 (40)
HLP (average)												0.8304
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Hot water usage for mixer showers
Hot water usage for baths
Hot water usage for other uses
Average daily hot water use (litres/day)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	127.9935	125.2874	121.9766	116.9055	112.8007	108.3824	106.6575	109.9537	113.4339	118.0758	123.2261	127.6563 (44)
Energy conte	202.7104	178.4076	187.4735	160.0378	151.8515	133.2689	128.9930	136.1456	139.8753	160.2278	175.5581	199.8789 (45)
Energy content (annual)										Total = Sum(45)m =		1954.4284
Distribution loss (46)m = 0.15 x (45)m	30.4066	26.7611	28.1210	24.0057	22.7777	19.9903	19.3489	20.4218	20.9813	24.0342	26.3337	29.9818 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	253.6693	224.4350	238.4324	209.3529	202.8104	182.5839	179.9519	187.1046	189.1904	211.1867	224.8732	250.8378 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	253.6693	224.4350	238.4324	209.3529	202.8104	182.5839	179.9519	187.1046	189.1904	211.1867	224.8732	250.8378 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2554.4284 (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	80.1409	70.8274	75.0747	65.5413	63.2303	56.6407	55.6299	58.0082	58.8373	66.0155	70.7018	79.1995 (65)

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

Metabolic gains (Table 5), Watts
(66)m
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
Pumps, fans
Losses e.g. evaporation (negative values) (Table 5)
Water heating gains (Table 5)
Total internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164 (66)
Lighting gains	91.5122	101.3171	91.5122	94.5626	91.5122	94.5626	91.5122	91.5122	94.5626	91.5122	94.5626	91.5122 (67)
Appliances gains	174.0804	175.8868	171.3347	161.6438	149.4109	137.9136	130.2327	128.4263	132.9784	142.6693	154.9022	166.3995 (68)
Cooking gains	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716 (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)	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732 (71)
Water heating gains (Table 5)	107.7163	105.3979	100.9068	91.0297	84.9870	78.6676	74.7714	77.9679	81.7185	88.7305	98.1970	106.4509 (72)
Total internal gains	429.2239	438.5167	419.6687	403.1511	381.8250	364.0587	349.4312	350.8214	362.1744	378.8269	403.5768	420.2776 (73)

6. Solar gains

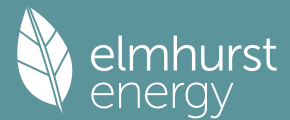
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
East	7.0400	19.6403	0.5700	0.7000	0.7700	38.2319 (76)						
South	4.0700	46.7521	0.5700	0.7000	0.7700	52.6140 (78)						
Solar gains	90.8459	160.9579	232.9310	303.6893	349.4213	349.7686	336.1067	302.3434	257.9099	181.6848	110.0362	76.9034 (83)
Total gains	520.0698	599.4746	652.5997	706.8403	731.2464	713.8273	685.5379	653.1648	620.0844	560.5117	513.6131	497.1810 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	75.1719	75.4135	75.6517	76.7912	77.0082	78.0348	78.0348	78.2280	77.6362	77.0082	76.5705	76.1181
alpha	6.0115	6.0276	6.0434	6.1194	6.1339	6.2023	6.2023	6.2152	6.1757	6.1339	6.1047	6.0745
util living area												

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	0.9798	0.9549	0.9054	0.7869	0.6215	0.4413	0.3169	0.3467	0.5461	0.8262	0.9547	0.9837 (86)
MIT	20.3014	20.4951	20.7016	20.8965	20.9777	20.9977	20.9998	20.9996	20.9919	20.8836	20.5768	20.2699 (87)
Th 2	20.2116	20.2140	20.2163	20.2270	20.2290	20.2384	20.2384	20.2402	20.2348	20.2290	20.2250	20.2207 (88)
util rest of house												
	0.9747	0.9446	0.8857	0.7517	0.5747	0.3895	0.2621	0.2896	0.4881	0.7875	0.9426	0.9796 (89)
MIT 2	19.5892	19.7776	19.9724	20.1517	20.2155	20.2374	20.2384	20.2401	20.2309	20.1469	19.8680	19.5661 (90)
Living area fraction									FLA = Living area / (4) =			0.4395 (91)
MIT	19.9023	20.0930	20.2929	20.4791	20.5505	20.5716	20.5730	20.5739	20.5654	20.4707	20.1796	19.8754 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9023	20.0930	20.2929	20.4791	20.5505	20.5716	20.5730	20.5739	20.5654	20.4707	20.1796	19.8754 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9724	0.9428	0.8878	0.7636	0.5945	0.4123	0.2862	0.3147	0.5134	0.8003	0.9418	0.9774	(94)
Useful gains	505.7091	565.2004	579.3668	539.7588	434.7366	294.2771	196.2093	205.5759	318.3536	448.5858	483.7032	485.9440	(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	800.1116	776.6276	702.8399	581.2731	443.0467	294.9994	196.2692	205.6831	321.0332	494.1191	658.4919	793.8709	(97)
Space heating kWh	219.0354	142.0790	91.8640	29.8903	6.1827	0.0000	0.0000	0.0000	0.0000	33.8768	125.8479	229.0976	(98a)
Space heating requirement - total per year (kWh/year)												877.8736	
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	219.0354	142.0790	91.8640	29.8903	6.1827	0.0000	0.0000	0.0000	0.0000	33.8768	125.8479	229.0976	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												877.8736	
Space heating per m2										(98c) / (4) =		14.5223	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													83.0000 (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	219.0354	142.0790	91.8640	29.8903	6.1827	0.0000	0.0000	0.0000	0.0000	33.8768	125.8479	229.0976	(98)
Space heating efficiency (main heating system 1)	83.0000	83.0000	83.0000	83.0000	83.0000	0.0000	0.0000	0.0000	0.0000	83.0000	83.0000	83.0000	(210)
Space heating fuel (main heating system)	263.8981	171.1796	110.6795	36.0124	7.4490	0.0000	0.0000	0.0000	0.0000	40.8154	151.6239	276.0212	(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	253.6693	224.4350	238.4324	209.3529	202.8104	182.5839	179.9519	187.1046	189.1904	211.1867	224.8732	250.8378	(64)
Efficiency of water heater (217)m	83.1661	82.5264	81.6184	80.3814	79.6302	79.4000	79.4000	79.4000	79.4000	80.4873	82.2855	83.2853	(216)
Fuel for water heating, kWh/month	305.0155	271.9553	292.1305	260.4493	254.6902	229.9546	226.6397	235.6481	238.2751	262.3850	273.2841	301.1791	(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	20.1209	16.1418	14.5339	10.6481	8.2249	6.7198	7.5030	9.7527	12.6679	16.6209	18.7733	20.6801	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1057.6790	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.4000	
Water heating fuel used												3151.6063	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												162.3874	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												4457.6727	(238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	1057.6790	0.2100	222.1126 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	3151.6063	0.2100	661.8373 (264)
Space and water heating			883.9499 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	162.3874	0.1443	23.4375 (268)
Total CO ₂ , kg/year			919.3167 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.2100 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	1057.6790	1.1300	1195.1773 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	3151.6063	1.1300	3561.3151 (278)
Space and water heating			4756.4924 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	162.3874	1.5338	249.0752 (282)
Total Primary energy kWh/year			5135.6684 (286)
Dwelling Primary energy Rate (DPER)			84.9600 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	60.4500 (1b)	x 2.4000 (2b)	= 145.0800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.4500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.0800 (5)

2. Ventilation rate

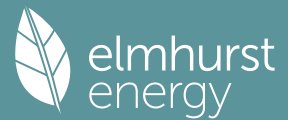
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1379 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3879 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3297 (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	0.4203	0.4121	0.4039	0.3626	0.3544	0.3132	0.3132	0.3050	0.3297	0.3544	0.3709	0.3874 (22b)
Effective ac	0.5883	0.5849	0.5815	0.5658	0.5628	0.5490	0.5490	0.5465	0.5543	0.5628	0.5688	0.5750 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (U _w = 1.20)			11.1100	1.1450	12.7214		(27)
External Wall	38.1400	11.1100	27.0300	0.1800	4.8654		(29a)
Total net area of external elements A _{um} (A, m ²)			38.1400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	17.5868	(33)
Party Wall			38.1400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							239.5752 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.0000	0.0500	0.3000	
E3 Sill				3.2000	0.0500	0.1600	
E4 Jamb				21.8000	0.0500	1.0900	
E7 Party floor between dwellings (in blocks of flats)				27.7900	0.0700	1.9453	

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P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	31.7800	0.0000	0.0000										
E18 Party wall between dwellings	4.8000	0.0600	0.2880										
E9 Balcony between dwellings, wall insulation continuous	3.0000	0.0200	0.0600										
E16 Corner (normal)	2.4000	0.0900	0.2160										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				4.0593 (36)									
Point Thermal bridges				0.0000									
Total fabric heat loss		(33) + (36) + (36a) =		21.6461 (37)									
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	28.1677	28.0035	27.8425	27.0863	26.9449	26.2863	26.2863	26.1643	26.5400	26.9449	27.2311	27.5303	(38)
Average = Sum(39)m / 12 =	49.8138	49.6495	49.4885	48.7324	48.5909	47.9324	47.9324	47.8104	48.1860	48.5909	48.8771	49.1763	(39)
												48.7317	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8240	0.8213	0.8187	0.8062	0.8038	0.7929	0.7929	0.7909	0.7971	0.8038	0.8086	0.8135	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												0.8061	
												31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.9943 (42)
Hot water usage for mixer showers													
57.6579	56.7914	55.5288	53.1130	51.3301	49.3419	48.2118	49.4649	50.8385	52.9733	55.4410	57.4370	(42a)	
Hot water usage for baths													
24.9180	24.5479	24.0268	23.0659	22.3464	21.5486	21.1177	21.6352	22.1987	23.0523	24.0330	24.8338	(42b)	
Hot water usage for other uses													
35.0539	33.7792	32.5045	31.2299	29.9552	28.6805	28.6805	29.9552	31.2299	32.5045	33.7792	35.0539	(42c)	
Average daily hot water use (litres/day)												108.1288	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
117.6298	115.1186	112.0601	107.4088	103.6317	99.5711	98.0100	101.0553	104.2671	108.5301	113.2532	117.3247	(44)	
Energy content (annual)	186.2969	163.9274	172.2323	147.0372	139.5082	122.4342	118.5347	125.1276	128.5717	147.2744	161.3500	183.7021	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1795.9966	
27.9445	24.5891	25.8348	22.0556	20.9262	18.3651	17.7802	18.7691	19.2858	22.0912	24.2025	27.5553	(46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.1035	49.9448	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
237.2558	209.9548	223.1912	196.3523	190.4672	171.5378	168.4795	176.0865	177.8868	198.2333	210.6650	234.6610	(62)	
WWHRS	-26.3588	-23.3119	-24.4109	-20.2132	-18.8380	-16.1198	-15.1097	-16.0677	-16.6782	-19.6617	-22.2743	-25.8707	(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	210.8970	186.6428	198.7803	176.1391	171.6292	155.4180	153.3698	160.0188	161.2086	178.5716	188.3907	208.7904	(64)
12Total per year (kWh/year)												2149.8562	(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	74.6835	66.0127	70.0070	61.2186	59.1262	52.9853	51.8990	54.3446	55.0789	61.7085	65.9776	73.8207	(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	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.3894	98.9668	89.3894	92.3690	89.3894	92.3690	89.3894	89.3894	92.3690	89.3894	92.3690	89.3894	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.0804	175.8868	171.3347	161.6438	149.4109	137.9136	130.2327	128.4263	132.9784	142.6693	154.9022	166.3995	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	(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)	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	(71)
Water heating gains (Table 5)	100.3810	98.2332	94.0954	85.0259	79.4707	73.5907	69.7567	73.0439	76.4984	82.9415	91.6356	99.2213	(72)
Total internal gains	419.7657	429.0017	410.7344	394.9537	374.1859	356.7882	342.2937	343.7745	354.7607	370.9150	394.8218	410.9252	(73)

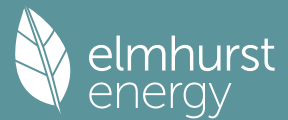
6. Solar gains

[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					7.0400	19.6403	0.6300		0.7000		0.7700	42.2563 (76)	
South					4.0700	46.7521	0.6300		0.7000		0.7700	58.1523 (78)	
Solar gains	100.4087	177.9009	257.4501	335.6565	386.2025	386.5863	371.4863	334.1691	285.0583	200.8095	121.6190	84.9985	(83)
Total gains	520.1743	606.9026	668.1845	730.6102	760.3884	743.3745	713.7800	677.9435	639.8191	571.7245	516.4408	495.9237	(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	

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tau	80.7581	81.0253	81.2888	82.5501	82.7905	83.9280	83.9280	84.1421	83.4861	82.7905	82.3057	81.8049
alpha	6.3839	6.4017	6.4193	6.5033	6.5194	6.5952	6.5952	6.6095	6.5657	6.5194	6.4870	6.4537
util living area	0.9807	0.9525	0.8940	0.7588	0.5860	0.4120	0.2954	0.3243	0.5162	0.8080	0.9536	0.9848 (86)
MIT	20.3714	20.5675	20.7649	20.9308	20.9877	20.9990	20.9999	20.9998	20.9957	20.9149	20.6336	20.3387 (87)
Th 2	20.2325	20.2349	20.2372	20.2480	20.2500	20.2595	20.2595	20.2612	20.2558	20.2500	20.2459	20.2416 (88)
util rest of house	0.9757	0.9416	0.8726	0.7226	0.5415	0.3646	0.2457	0.2723	0.4620	0.7679	0.9409	0.9808 (89)
MIT 2	19.5152	19.7585	19.9943	20.1849	20.2407	20.2589	20.2594	20.2612	20.2532	20.1748	19.8521	19.4818 (90)
Living area fraction									FLA = Living area / (4) =			0.4395 (91)
MIT	19.8915	20.1141	20.3330	20.5128	20.5690	20.5842	20.5849	20.5858	20.5796	20.5001	20.1956	19.8584 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8915	20.1141	20.3330	20.5128	20.5690	20.5842	20.5849	20.5858	20.5796	20.5001	20.1956	19.8584 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9730	0.9396	0.8755	0.7357	0.5606	0.3854	0.2676	0.2951	0.4857	0.7819	0.9400	0.9784 (94)
Useful gains	506.1545	570.2622	584.9729	537.5112	426.2812	286.5063	190.9823	200.0819	310.7805	447.0127	485.4344	485.2022 (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	776.6733	755.3716	684.5739	565.9174	430.9540	286.8363	191.0057	200.1263	312.2254	481.0544	640.0759	770.0247 (97)
Space heating kWh	201.2660	124.3935	74.1032	20.4525	3.4766	0.0000	0.0000	0.0000	0.0000	25.3270	111.3419	211.9079 (98a)
Space heating requirement - total per year (kWh/year)												772.2685
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	201.2660	124.3935	74.1032	20.4525	3.4766	0.0000	0.0000	0.0000	0.0000	25.3270	111.3419	211.9079 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												772.2685
Space heating per m2										(98c) / (4) =		12.7753 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	201.2660	124.3935	74.1032	20.4525	3.4766	0.0000	0.0000	0.0000	0.0000	25.3270	111.3419	211.9079 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	217.8203	134.6250	80.1982	22.1348	3.7625	0.0000	0.0000	0.0000	0.0000	27.4101	120.4999	229.3376 (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	210.8970	186.6428	198.7803	176.1391	171.6292	155.4180	153.3698	160.0188	161.2086	178.5716	188.3907	208.7904 (64)
Efficiency of water heater (217)m	84.2813	83.5317	82.4664	81.1164	80.4545	80.3000	80.3000	80.3000	80.3000	81.2766	83.2932	80.3000 (216)
Fuel for water heating, kWh/month	250.2298	223.4394	241.0440	217.1437	213.3245	193.5467	190.9960	199.2762	200.7579	219.7084	226.1779	247.3432 (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	18.5733	14.9002	13.4160	9.8291	7.5923	6.2030	6.9260	9.0026	11.6935	15.3425	17.3293	19.0896 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-16.2835	-24.1718	-36.5663	-43.3478	-48.7209	-46.2151	-45.6646	-42.1315	-36.2387	-28.6234	-18.3326	-13.9408 (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	-5.8442	-12.5674	-25.4916	-39.0460	-52.3718	-52.8826	-52.2476	-43.8856	-31.7159	-18.2053	-7.8779	-4.6005 (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												835.7885 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2622.9876 (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)												149.8975 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-746.9732 (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												2947.7004 (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	835.7885	0.2100	175.5156 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2622.9876	0.2100	550.8274 (264)
Space and water heating			726.3430 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	149.8975	0.1443	21.6348 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-400.2369	0.1335	-53.4340
PV Unit electricity exported	-346.7362	0.1253	-43.4567
Total			-96.8907 (269)
Total CO2, kg/year			663.0164 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9700 (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	835.7885	1.1300	944.4410 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2622.9876	1.1300	2963.9760 (278)
Space and water heating			3908.4170 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	149.8975	1.5338	229.9178 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-400.2369	1.4934	-597.6954
PV Unit electricity exported	-346.7362	0.4600	-159.5068
Total			-757.2022 (283)
Total Primary energy kWh/year			3511.2334 (286)
Target Primary Energy Rate (TPER)			58.0800 (287)

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Property Reference	Baseline			Issued on Date	06/01/2025
Assessment Reference	FF-Unit 7 (Block A)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	84 B	DER	16.15	TER	11.77
Environmental	89 B	% DER < TER			-37.21
CO ₂ Emissions (t/year)	0.76	DFEE	18.84	TFEE	17.53
Compliance Check	See BREL	% DFEE < TFEE			-7.46
% DPER < TPER	-44.18	DPER	90.24	TPER	62.59
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.1400 (1b)	2.4000 (2b)	117.9360 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.1400		117.9360 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	117.9360 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1696 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4196 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3252 (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	0.4146	0.4065	0.3983	0.3577	0.3496	0.3089	0.3089	0.3008	0.3252	0.3496	0.3658	0.3821 (22b)
Effective ac	0.5859	0.5826	0.5793	0.5640	0.5611	0.5477	0.5477	0.5452	0.5529	0.5611	0.5669	0.5730 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.20)			8.8000	1.1450	10.0763		(27)
External Wall	20.6400	8.8000	11.8400	0.1800	2.1312	70.0000	828.8000 (29a)
Total net area of external elements A _{um} (A, m ²)			20.6400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	12.2075		(33)
Party Wall			48.7900	0.0000	0.0000	180.0000	8782.2000 (32)
Party Floor			49.1400			40.0000	1965.6000 (32d)
Party Ceiling			49.1400			30.0000	1474.2000 (32b)
Internal Wall			71.2300			9.0000	641.0700 (32c)

Heat capacity C_m = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13691.8700 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 278.6298 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.9500	0.3000	1.4850
E3 Sill	4.0000	0.0400	0.1600
E4 Jamb	17.4000	0.0500	0.8700
E7 Party floor between dwellings (in blocks of flats)	17.2000	0.0700	1.2040
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	40.6600	0.0000	0.0000
E18 Party wall between dwellings	4.8000	0.0600	0.2880
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.0070 (36)

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Point Thermal bridges
Total fabric heat loss (33) + (36) + (36a) = 0.0000
16.2145 (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	22.8044	22.6745	22.5472	21.9492	21.8373	21.3165	21.3165	21.2200	21.5171	21.8373	22.0636	22.3003 (38)
Heat transfer coeff	39.0189	38.8890	38.7617	38.1637	38.0518	37.5310	37.5310	37.4345	37.7316	38.0518	38.2782	38.5148 (39)
Average = Sum(39)m / 12 =												38.1632
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7940	0.7914	0.7888	0.7766	0.7744	0.7638	0.7638	0.7618	0.7678	0.7744	0.7790	0.7838 (40)
HLP (average)												0.7766
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6648 (42)
Hot water usage for mixer showers												
58.6495	57.7681	56.4838	54.0264	52.2129	50.1905	49.0410	50.3156	51.7129	53.8843	56.3945	58.4248 (42a)	
Hot water usage for baths												
23.7285	23.3761	22.8798	21.9648	21.2797	20.5200	20.1096	20.6024	21.1390	21.9519	22.8857	23.6483 (42b)	
Hot water usage for other uses												
33.3467	32.1341	30.9215	29.7088	28.4962	27.2836	27.2836	28.4962	29.7088	30.9215	32.1341	33.3467 (42c)	
Average daily hot water use (litres/day)												106.3881 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
115.7247	113.2783	110.2851	105.7001	101.9888	97.9941	96.4342	99.4143	102.5607	106.7576	111.4142	115.4198 (44)	
Energy content	183.2796	161.3068	169.5040	144.6981	137.2966	120.4952	116.6289	123.0956	126.4676	144.8691	158.7300	180.7194 (45)
Energy content (annual)										Total = Sum(45)m =		1767.0909
Distribution loss (46)m = 0.15 x (45)m												
27.4919	24.1960	25.4256	21.7047	20.5945	18.0743	17.4943	18.4643	18.9701	21.7304	23.8095	27.1079 (46)	
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	48.3259	49.1418	50.6604	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
234.2385	207.3342	220.4629	194.0132	188.2555	168.8211	165.7707	173.7561	175.7826	195.8280	208.0451	231.6783 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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 (63c)	
FGHRS	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												
234.2385	207.3342	220.4629	194.0132	188.2555	168.8211	165.7707	173.7561	175.7826	195.8280	208.0451	231.6783 (64)	
12Total per year (kWh/year)												2363.9862 (64)
Electric shower(s)												2364 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
73.6802	65.1413	69.0998	60.4409	58.3908	52.1461	51.0646	53.5944	54.3792	60.9087	65.1065	72.8289 (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	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6200	84.8293	76.6200	79.1740	76.6200	79.1740	76.6200	76.6200	79.1740	76.6200	79.1740	76.6200 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	145.0005	146.5051	142.7135	134.6415	124.4520	114.8753	108.4775	106.9728	110.7645	118.8365	129.0260	138.6027 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241 (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)	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925 (71)
Water heating gains (Table 5)	99.0325	96.9365	92.8761	83.9457	78.4823	72.4252	68.6352	72.0355	75.5267	81.8665	90.4257	97.8884 (72)
Total internal gains	371.6252	379.2431	363.1817	348.7333	330.5264	314.4466	301.7048	303.6005	313.4374	328.2952	349.5979	364.0832 (73)

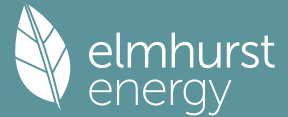
6. Solar gains

[Jan]												
				Area	Solar flux		g		FF			Gains
				m2	Table 6a	Specific data				Access		W
					W/m2	or Table 6b			Specific data	factor		
									or Table 6c	Table 6d		
West				8.8000	19.6403		0.5700		0.7000	0.7700		47.7899 (80)
Solar gains	47.7899	93.4872	153.9601	224.5416	275.1841	281.6999	268.1898	230.3711	179.0619	110.9304	59.5884	39.3001 (83)
Total gains	419.4151	472.7303	517.1418	573.2749	605.7106	596.1466	569.8946	533.9716	492.4993	439.2256	409.1862	403.3833 (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	97.4731	97.7987	98.1199	99.6574	99.9504	101.3375	101.3375	101.5986	100.7987	99.9504	99.3594	98.7489
alpha	7.4982	7.5199	7.5413	7.6438	7.6634	7.7558	7.7558	7.7732	7.7199	7.6634	7.6240	7.5833
util living area												
	0.9866	0.9674	0.9162	0.7701	0.5803	0.4027	0.2898	0.3225	0.5268	0.8335	0.9652	0.9894 (86)
MIT	20.4942	20.6409	20.8122	20.9566	20.9948	20.9997	21.0000	21.0000	20.9981	20.9368	20.7076	20.4717 (87)

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Th 2	20.2585	20.2608	20.2630	20.2736	20.2756	20.2849	20.2849	20.2866	20.2813	20.2756	20.2716	20.2674 (88)
util rest of house	0.9825	0.9584	0.8962	0.7331	0.5366	0.3578	0.2427	0.2725	0.4728	0.7935	0.9540	0.9861 (89)
MIT 2	19.8106	19.9538	20.1140	20.2441	20.2728	20.2848	20.2848	20.2866	20.2805	20.2336	20.0289	19.7964 (90)
Living area fraction									FLA = Living area / (4) =			0.5275 (91)
MIT	20.1712	20.3162	20.4823	20.6200	20.6537	20.6619	20.6621	20.6629	20.6590	20.6045	20.3869	20.1526 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1712	20.3162	20.4823	20.6200	20.6537	20.6619	20.6621	20.6629	20.6590	20.6045	20.3869	20.1526 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9820	0.9592	0.9025	0.7511	0.5595	0.3815	0.2675	0.2988	0.5013	0.8124	0.9560	0.9855	(94)
Useful gains	411.8534	453.4361	466.7440	430.5767	338.8776	227.4285	152.4493	159.5688	246.8729	356.8224	391.1924	397.5257	(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	619.2764	599.5212	541.9765	447.2775	340.7030	227.5086	152.4533	159.5782	247.4814	380.6901	508.5982	614.4109	(97)
Space heating kWh	154.3227	98.1692	55.9730	12.0245	1.3581	0.0000	0.0000	0.0000	0.0000	17.7575	84.5322	161.3625	(98a)
Space heating requirement - total per year (kWh/year)												585.4998	
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	154.3227	98.1692	55.9730	12.0245	1.3581	0.0000	0.0000	0.0000	0.0000	17.7575	84.5322	161.3625	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												585.4998	
Space heating per m2										(98c) / (4) =		11.9149	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												83.0000 (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	154.3227	98.1692	55.9730	12.0245	1.3581	0.0000	0.0000	0.0000	0.0000	17.7575	84.5322	161.3625 (98)
Space heating efficiency (main heating system 1)	83.0000	83.0000	83.0000	83.0000	83.0000	0.0000	0.0000	0.0000	0.0000	83.0000	83.0000	83.0000 (210)
Space heating fuel (main heating system)	185.9310	118.2761	67.4374	14.4874	1.6363	0.0000	0.0000	0.0000	0.0000	21.3946	101.8460	194.4127 (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	234.2385	207.3342	220.4629	194.0132	188.2555	168.8211	165.7707	173.7561	175.7826	195.8280	208.0451	231.6783 (64)
Efficiency of water heater (217)m	82.6063	81.9743	81.0029	79.8555	79.4556	79.4000	79.4000	79.4000	79.4000	80.0504	81.7070	79.4000 (216)
Fuel for water heating, kWh/month	283.5602	252.9259	272.1668	242.9555	236.9316	212.6210	208.7792	218.8363	221.3887	244.6308	254.6232	82.7188 (217)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	15.9201	12.7717	11.4995	8.4250	6.5077	5.3169	5.9366	7.7166	10.0231	13.1508	14.8538	16.3626 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												705.4215 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.4000
Water heating fuel used												2929.4986 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												128.4845 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												3849.4046 (238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	705.4215	0.2100	148.1385 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2929.4986	0.2100	615.1947 (264)
Space and water heating			763.3332 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	128.4845	0.1443	18.5443 (268)
Total CO2, kg/year			793.8068 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			16.1500 (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	705.4215	1.1300	797.1263 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2929.4986	1.1300	3310.3335 (278)
Space and water heating			4107.4598 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	128.4845	1.5338	197.0738 (282)
Total Primary energy kWh/year			4434.6343 (286)
Dwelling Primary energy Rate (DPER)			90.2400 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	49.1400	2.4000	117.9360
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.1400		117.9360 (1b) - (3b)
Dwelling volume			117.9360 (4)

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) = 0.1696 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4196 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3252 (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	0.4146	0.4065	0.3983	0.3577	0.3496	0.3089	0.3089	0.3008	0.3252	0.3496	0.3658	0.3821 (22b)
Effective ac	0.5859	0.5826	0.5793	0.5640	0.5611	0.5477	0.5477	0.5452	0.5529	0.5611	0.5669	0.5730 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			8.8000	1.1450	10.0763		(27)
External Wall	20.6400	8.8000	11.8400	0.1800	2.1312		(29a)
Total net area of external elements Aum(A, m2)			20.6400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		12.2075		(33)
Party Wall			48.7900	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							288.6298 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				4.9500	0.0500	0.2475	
E3 Sill				4.0000	0.0500	0.2000	
E4 Jamb				17.4000	0.0500	0.8700	
E7 Party floor between dwellings (in blocks of flats)				17.2000	0.0700	1.2040	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				40.6600	0.0000	0.0000	
E18 Party wall between dwellings				4.8000	0.0600	0.2880	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.8095 (36)

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Point Thermal bridges
Total fabric heat loss (33) + (36) + (36a) = 0.0000
15.0170 (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 22.8044 22.6745 22.5472 21.9492 21.8373 21.3165 21.3165 21.2200 21.5171 21.8373 22.0636 22.3003 (38)
Average = Sum(39)m / 12 = 37.8214 37.6915 37.5642 36.9662 36.8543 36.3335 36.3335 36.2370 36.5341 36.8543 37.0807 37.3173 (39)
36.9657

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
HLP (average) 0.7697 0.7670 0.7644 0.7523 0.7500 0.7394 0.7394 0.7374 0.7435 0.7500 0.7546 0.7594 (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 1.6648 (42)
Hot water usage for mixer showers 52.1329 51.3494 50.2078 48.0235 46.4115 44.6138 43.5920 44.7250 45.9670 47.8971 50.1284 51.9332 (42a)
Hot water usage for baths 22.5421 22.2073 21.7359 20.8666 20.2157 19.4940 19.1041 19.5723 20.0820 20.8543 21.7414 22.4659 (42b)
Hot water usage for other uses 31.6793 30.5274 29.3754 28.2234 27.0714 25.9195 25.9195 27.0714 28.2234 29.3754 30.5274 31.6793 (42c)
Average daily hot water use (litres/day) 97.7642 (43)
Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Energy conte 106.3543 104.0841 101.3190 97.1135 93.6986 90.0272 88.6156 91.3687 94.2724 98.1268 102.3972 106.0784 (44)
Energy content (annual) 168.4392 148.2144 155.7236 132.9435 126.1363 110.6990 107.1729 113.1336 116.2473 133.1572 145.8836 166.0931 (45)
Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1623.8435
25.2659 22.2322 23.3585 19.9415 18.9205 16.6048 16.0759 16.9700 17.4371 19.9736 21.8825 24.9140 (46)
Water storage loss:
Total storage loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)
If cylinder contains dedicated solar storage 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)
Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)
Combi loss 50.9589 46.0274 50.9589 47.8916 47.7478 44.3970 45.1575 46.5605 46.4905 50.0043 49.3151 50.9589 (61)
Total heat required for water heating calculated for each month
219.3981 194.2418 206.6825 180.8350 173.8841 155.0960 152.3304 159.6940 162.7378 183.1615 195.1987 217.0520 (62)
WWHRS -23.8330 -21.0781 -22.0718 -18.2763 -17.0328 -14.5751 -13.6619 -14.5280 -15.0800 -17.7776 -20.1399 -23.3916 (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 195.5652 173.1637 184.6107 162.5588 156.8513 140.5208 138.6685 145.1660 147.6578 165.3839 175.0587 193.6603 (64)
Total per year (kWh/year) = Sum(64)m = 1978.8658 (64)
1979 (64)
12Total per year (kWh/year)
Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month 68.7458 60.7881 64.5178 56.1766 53.8773 47.9067 46.9244 49.2570 50.2749 56.7758 60.8351 67.9657 (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 83.2406 83.2406 83.2406 83.2406 83.2406 83.2406 83.2406 83.2406 83.2406 83.2406 83.2406 83.2406 (66)
74.7595 82.7695 74.7595 77.2515 74.7595 77.2515 74.7595 77.2515 74.7595 77.2515 74.7595 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 145.0005 146.5051 142.7135 134.6415 124.4520 114.8753 108.4775 106.9728 110.7645 118.8365 129.0260 138.6027 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 31.3241 31.3241 31.3241 31.3241 31.3241 31.3241 31.3241 31.3241 31.3241 31.3241 31.3241 31.3241 (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) -66.5925 -66.5925 -66.5925 -66.5925 -66.5925 -66.5925 -66.5925 -66.5925 -66.5925 -66.5925 -66.5925 -66.5925 (71)
Water heating gains (Table 5) 92.4002 90.4585 86.7175 78.0230 72.4157 66.5370 63.0704 66.2057 69.8262 76.3116 84.4931 91.3517 (72)
Total internal gains 363.1324 370.7053 355.1627 340.8882 322.5994 306.6360 294.2796 295.9102 305.8144 320.8798 341.7428 355.6861 (73)

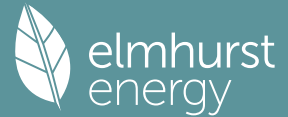
6. Solar gains

[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
West 8.8000 19.6403 0.6300 0.7000 0.7700 52.8204 (80)
Solar gains 52.8204 103.3279 170.1664 248.1775 304.1509 311.3526 296.4203 254.6207 197.9106 122.6073 65.8608 43.4369 (83)
Total gains 415.9528 474.0332 525.3291 589.0657 626.7503 617.9886 590.6999 550.5309 503.7249 443.4871 407.6037 399.1230 (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)
tau Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
alpha 104.1684 104.5273 104.8816 106.5783 106.9018 108.4343 108.4343 108.7229 107.8388 106.9018 106.2493 105.5756
util living area 7.9446 7.9685 7.9921 8.1052 8.1268 8.2290 8.2290 8.2482 8.1893 8.1268 8.0833 8.0384
0.9873 0.9657 0.9042 0.7380 0.5450 0.3762 0.2706 0.3028 0.4996 0.8155 0.9644 0.9902 (86)
MIT 20.5422 20.6910 20.8555 20.9739 20.9976 20.9999 21.0000 21.0000 20.9991 20.9551 20.7459 20.5190 (87)

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Th 2	20.2797	20.2820	20.2843	20.2949	20.2969	20.3062	20.3062	20.3079	20.3026	20.2969	20.2929	20.2887 (88)
util rest of house	0.9834	0.9561	0.8823	0.7010	0.5045	0.3355	0.2280	0.2572	0.4495	0.7744	0.9529	0.9871 (89)
MIT 2	19.7604	19.9454	20.1397	20.2727	20.2952	20.3061	20.3062	20.3079	20.3021	20.2597	20.0241	19.7389 (90)
Living area fraction									FLA = Living area / (4) =			0.5275 (91)
MIT	20.1728	20.3387	20.5173	20.6426	20.6657	20.6721	20.6721	20.6730	20.6698	20.6265	20.4048	20.1504 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1728	20.3387	20.5173	20.6426	20.6657	20.6721	20.6721	20.6730	20.6698	20.6265	20.4048	20.1504 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9827	0.9570	0.8898	0.7195	0.5258	0.3569	0.2505	0.2812	0.4759	0.7943	0.9549	0.9864	(94)
Useful gains	408.7576	453.6386	467.4474	423.8261	329.5635	220.5901	147.9540	154.8360	239.7296	352.2671	389.2213	393.6839	(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	600.3320	581.9087	526.5478	434.0778	330.4257	220.6197	147.9552	154.8391	240.0201	369.5195	493.3524	595.2261	(97)
Space heating kWh	142.5313	86.1975	43.9707	7.3812	0.6415	0.0000	0.0000	0.0000	0.0000	12.8358	74.9744	149.9474	(98a)
Space heating requirement - total per year (kWh/year)												518.4798	
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	142.5313	86.1975	43.9707	7.3812	0.6415	0.0000	0.0000	0.0000	0.0000	12.8358	74.9744	149.9474	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												518.4798	
Space heating per m2										(98c) / (4) =		10.5511	(99)

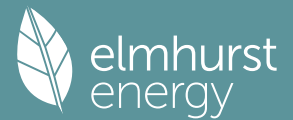
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	142.5313	86.1975	43.9707	7.3812	0.6415	0.0000	0.0000	0.0000	0.0000	12.8358	74.9744	149.9474	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	154.2547	93.2873	47.5873	7.9884	0.6942	0.0000	0.0000	0.0000	0.0000	13.8916	81.1411	162.2808	(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	195.5652	173.1637	184.6107	162.5588	156.8513	140.5208	138.6685	145.1660	147.6578	165.3839	175.0587	193.6603	(64)
Efficiency of water heater	83.7140	82.9674	81.8226	80.6388	80.3317	80.3000	80.3000	80.3000	80.3000	80.8634	82.6989	83.8393	(216)
Fuel for water heating, kWh/month	233.6110	208.7128	225.6231	201.5887	195.2546	174.9948	172.6881	180.7796	183.8827	204.5225	211.6821	230.9899	(217)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.5336	12.4616	11.2203	8.2205	6.3497	5.1878	5.7924	7.5292	9.7797	12.8315	14.4932	15.9653	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-13.3209	-19.8196	-30.0548	-35.7251	-40.2493	-38.2278	-37.7861	-34.8233	-29.8851	-23.5233	-15.0173	-11.4003	(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)	-4.6668	-10.0458	-20.3922	-31.2531	-41.9293	-42.3290	-41.8070	-35.1003	-25.3555	-14.5439	-6.2892	-3.6719	(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													561.1253 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													2424.3300 (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)													125.3647 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-607.2169 (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													2589.6031 (238)

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

Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	561.1253	0.2100	117.8363 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2424.3300	0.2100	509.1093 (264)
Space and water heating			626.9456 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	125.3647	0.1443	18.0940 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-329.8329	0.1334	-44.0152
PV Unit electricity exported	-277.3840	0.1253	-34.7625
Total			-78.7777 (269)
Total CO2, kg/year			578.1911 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7700 (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	561.1253	1.1300	634.0716 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2424.3300	1.1300	2739.4929 (278)
Space and water heating			3373.5645 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	125.3647	1.5338	192.2885 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-329.8329	1.4931	-492.4843
PV Unit electricity exported	-277.3840	0.4600	-127.5950
Total			-620.0793 (283)
Total Primary energy kWh/year			3075.8745 (286)
Target Primary Energy Rate (TPER)			62.5900 (287)

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Property Reference	Baseline				Issued on Date	06/01/2025
Assessment Reference	FF-Unit 11 (Block B)		Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS					
SAP Rating	84 B	DER	15.99	TER	11.72	
Environmental	88 B	% DER < TER				-36.43
CO ₂ Emissions (t/year)	0.95	DFEE	24.43	TFEE	23.01	
Compliance Check	See BREL	% DFEE < TFEE				-6.15
% DPER < TPER	-43.55	DPER	89.13	TPER	62.09	
Assessor Details	Mr. Mark Simons				Assessor ID	5542-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.9000 (1b)	2.4000 (2b)	150.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.9000		150.9600 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	150.9600 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1325 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3825 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3251 (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	0.4145	0.4064	0.3983	0.3576	0.3495	0.3089	0.3089	0.3007	0.3251	0.3495	0.3658	0.3820 (22b)
Effective ac	0.5859	0.5826	0.5793	0.5639	0.5611	0.5477	0.5477	0.5452	0.5528	0.5611	0.5669	0.5730 (25)

3. Heat losses and heat loss parameter

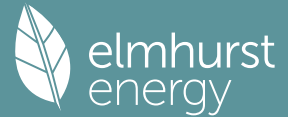
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.20)			11.4800	1.1450	13.1450		(27)
External Wall	39.0200	11.4800	27.5400	0.1800	4.9572	70.0000	1927.8000 (29a)
Total net area of external elements A _{um} (A, m ²)			39.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.1022		(33)
Party Wall			39.0200	0.0000	0.0000	180.0000	7023.6000 (32)
Party Floor			62.9000			40.0000	2516.0000 (32d)
Party Ceiling			62.9000			30.0000	1887.0000 (32b)
Internal Wall			104.0600			9.0000	936.5400 (32c)

Heat capacity C_m = Sum(A x k)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 14290.9400 (34)
227.2010 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.1500	0.3000	1.8450
E3 Sill	5.2000	0.0400	0.2080
E4 Jamb	17.4000	0.0500	0.8700
E7 Party floor between dwellings (in blocks of flats)	32.5200	0.0700	2.2764
E16 Corner (normal)	2.4000	0.0900	0.2160
E18 Party wall between dwellings	4.8000	0.0600	0.2880
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.5200	0.0000	0.0000

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Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges
 Total fabric heat loss

(33) + (36) + (36a) = 23.8056 (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	29.1883	29.0221	28.8592	28.0941	27.9509	27.2845	27.2845	27.1611	27.5412	27.9509	28.2405	28.5433	(38)
Heat transfer coeff	52.9939	52.8277	52.6648	51.8997	51.7565	51.0901	51.0901	50.9667	51.3468	51.7565	52.0461	52.3489	(39)
Average = Sum(39)m / 12 =												51.8990	
HLP	0.8425	0.8399	0.8373	0.8251	0.8228	0.8122	0.8122	0.8103	0.8163	0.8228	0.8274	0.8323	(40)
HLP (average)												0.8251	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0623 (42)
Hot water usage for mixer showers													
66.1478	65.1538	63.7052	60.9336	58.8883	56.6074	55.3109	56.7485	58.3243	60.7734	63.6045	65.8944	(42a)	
Hot water usage for baths													
26.7456	26.3484	25.7890	24.7577	23.9854	23.1291	22.6666	23.2220	23.8268	24.7431	25.7957	26.6552	(42b)	
Hot water usage for other uses													
37.6319	36.2635	34.8950	33.5266	32.1582	30.7897	30.7897	32.1582	33.5266	34.8950	36.2635	37.6319	(42c)	
Average daily hot water use (litres/day)												119.9943	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.5254	127.7656	124.3893	119.2180	115.0319	110.5262	108.7672	112.1287	115.6777	120.4115	125.6636	130.1815	(44)
Energy conte	206.7203	181.9366	191.1817	163.2034	154.8551	135.9049	131.5445	138.8387	142.6422	163.3973	179.0309	203.8328	(45)
Energy content (annual)										Total = Sum(45)m =		1993.0882	
Distribution loss (46)m = 0.15 x (45)m													
31.0080	27.2905	28.6773	24.4805	23.2283	20.3857	19.7317	20.8258	21.3963	24.5096	26.8546	30.5749	(46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
257.6792	227.9640	242.1406	212.5185	205.8140	185.2200	182.5034	189.7976	191.9573	214.3562	228.3459	254.7917	(62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.6792	227.9640	242.1406	212.5185	205.8140	185.2200	182.5034	189.7976	191.9573	214.3562	228.3459	254.7917	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2593.0882	(64)
Electric shower(s)												2593	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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													
81.4742	72.0008	76.3076	66.5939	64.2290	57.5171	56.4783	58.9036	59.7573	67.0693	71.8565	80.5141	(65)	

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

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.8578	105.0211	94.8578	98.0197	94.8578	98.0197	94.8578	94.8578	98.0197	94.8578	98.0197	94.8578	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.1971	182.0670	177.3549	167.3236	154.6607	142.7595	134.8087	132.9388	137.6509	147.6822	160.3451	172.2463	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	(71)
Water heating gains (Table 5)	109.5083	107.1440	102.5640	92.4915	86.3294	79.8849	75.9117	79.1715	82.9963	90.1469	99.8007	108.2179	(72)
Total internal gains	441.4982	451.1670	431.7117	414.7697	392.7828	374.5991	359.5131	360.9031	372.6018	389.6219	415.1005	432.2570	(73)

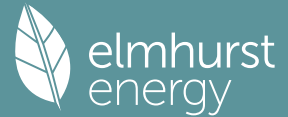
6. Solar gains

[Jan]													
				Area m2	Solar flux Table 6a		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				11.4800	10.6334		0.5700		0.7000		0.7700		33.7536 (74)
Solar gains	33.7536	64.5048	109.6095	176.0609	237.1701	253.8977	237.0459	188.0657	131.7861	76.7846	41.6394	28.1387	(83)
Total gains	475.2518	515.6718	541.3212	590.8306	629.9530	628.4967	596.5590	548.9687	504.3879	466.4065	456.7398	460.3956	(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)														
tau	74.9087	75.1443	75.3768	76.4880	76.6996	77.7001	77.7001	77.8882	77.3116	76.6996	76.2728	75.8317		
alpha	5.9939	6.0096	6.0251	6.0992	6.1133	6.1800	6.1800	6.1925	6.1541	6.1133	6.0849	6.0554		
util living area	0.9887	0.9799	0.9598	0.8839	0.7233	0.5158	0.3763	0.4258	0.6766	0.9130	0.9766	0.9904	(86)	

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MIT	20.1886	20.3249	20.5224	20.7926	20.9495	20.9945	20.9993	20.9986	20.9744	20.7793	20.4561	20.1705 (87)
Th 2	20.2166	20.2189	20.2211	20.2316	20.2336	20.2427	20.2427	20.2444	20.2392	20.2336	20.2296	20.2255 (88)
util rest of house												
	0.9857	0.9747	0.9493	0.8571	0.6751	0.4567	0.3118	0.3565	0.6115	0.8864	0.9697	0.9879 (89)
MIT 2	19.4836	19.6193	19.8127	20.0714	20.2015	20.2402	20.2425	20.2440	20.2259	20.0664	19.7581	19.4731 (90)
Living area fraction												
MIT	19.7740	19.9099	20.1050	20.3685	20.5096	20.5509	20.5543	20.5549	20.5342	20.3601	20.0457	19.7604 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7740	19.9099	20.1050	20.3685	20.5096	20.5509	20.5543	20.5549	20.5342	20.3601	20.0457	19.7604 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9837	0.9723	0.9475	0.8623	0.6930	0.4809	0.3384	0.3851	0.6374	0.8913	0.9677	0.9860	(94)
Useful gains	467.4836	501.3879	512.9202	509.4681	436.5528	302.2597	201.8591	211.4024	321.5135	415.6994	441.9879	453.9580	(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													
	820.0292	792.9405	716.5071	595.2098	455.9547	304.0343	202.0250	211.7595	330.3756	505.1481	673.7714	814.5686	(97)
Space heating kWh													
	262.2940	195.9234	151.4686	61.7340	14.4351	0.0000	0.0000	0.0000	0.0000	66.5498	166.8841	268.2943	(98a)
Space heating requirement - total per year (kWh/year)												1187.5832	
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													
	262.2940	195.9234	151.4686	61.7340	14.4351	0.0000	0.0000	0.0000	0.0000	66.5498	166.8841	268.2943	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1187.5832	
Space heating per m2											(98c) / (4) =	18.8805	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													83.0000 (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													
	262.2940	195.9234	151.4686	61.7340	14.4351	0.0000	0.0000	0.0000	0.0000	66.5498	166.8841	268.2943	(98)
Space heating efficiency (main heating system 1)													
	83.0000	83.0000	83.0000	83.0000	83.0000	0.0000	0.0000	0.0000	0.0000	83.0000	83.0000	83.0000	(210)
Space heating fuel (main heating system)													
	316.0168	236.0523	182.4923	74.3783	17.3916	0.0000	0.0000	0.0000	0.0000	80.1805	201.0652	323.2461	(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													
	257.6792	227.9640	242.1406	212.5185	205.8140	185.2200	182.5034	189.7976	191.9573	214.3562	228.3459	254.7917	(64)
Efficiency of water heater (217)m													
	83.5172	83.1562	82.5027	81.1860	79.9118	79.4000	79.4000	79.4000	79.4000	81.2819	82.8175	83.5899	(217)
Fuel for water heating, kWh/month													
	308.5343	274.1395	293.4941	261.7675	257.5513	233.2745	229.8531	239.0398	241.7598	263.7195	275.7220	304.8114	(219)
Space cooling fuel requirement (221)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa													
	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting													
	21.1458	16.9640	15.2742	11.1905	8.6439	7.0621	7.8852	10.2495	13.3131	17.4675	19.7295	21.7335	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1430.8232	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.4000	
Water heating fuel used												3183.6670	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												170.6588	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												4871.1490	(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	1430.8232	0.2100	300.4729 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3183.6670	0.2100	668.5701 (264)
Space and water heating			969.0429 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	170.6588	0.1443	24.6313 (268)
Total CO2, kg/year			1005.6035 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.9900 (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	1430.8232	1.1300	1616.8302 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3183.6670	1.1300	3597.5437 (278)
Space and water heating			5214.3739 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	170.6588	1.5338	261.7622 (282)
Total Primary energy kWh/year			5606.2369 (286)
Dwelling Primary energy Rate (DPER)			89.1300 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	62.9000 (1b)	x 2.4000 (2b)	= 150.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 150.9600 (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)

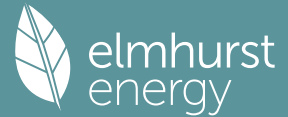
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1325 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3825	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3251 (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	0.4145	0.4064	0.3983	0.3576	0.3495	0.3089	0.3089	0.3007	0.3251	0.3495	0.3658	0.3820 (22b)
Effective ac	0.5859	0.5826	0.5793	0.5639	0.5611	0.5477	0.5477	0.5452	0.5528	0.5611	0.5669	0.5730 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			11.4800	1.1450	13.1450		(27)
External Wall	39.0200	11.4800	27.5400	0.1800	4.9572		(29a)
Total net area of external elements Aum(A, m2)			39.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.1022		(33)
Party Wall			39.0200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							237.2010 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E2 Other lintels (including other steel lintels)				6.1500	0.0500		0.3075
E3 Sill				5.2000	0.0500		0.2600
E4 Jamb				17.4000	0.0500		0.8700
E7 Party floor between dwellings (in blocks of flats)				32.5200	0.0700		2.2764
E16 Corner (normal)				2.4000	0.0900		0.2160
E18 Party wall between dwellings				4.8000	0.0600		0.2880

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P3 Party wall - Intermediate floor between dwellings (in blocks of flats) 32.5200 0.0000 0.0000
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.2179 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 22.3201 (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 29.1883 29.0221 28.8592 28.0941 27.9509 27.2845 27.2845 27.1611 27.5412 27.9509 28.2405 28.5433 (38)
 Average = Sum(39)m / 12 = 51.5084 51.3422 51.1793 50.4142 50.2710 49.6046 49.6046 49.4812 49.8613 50.2710 50.5606 50.8634 (39)
 51.5084 51.3422 51.1793 50.4142 50.2710 49.6046 49.6046 49.4812 49.8613 50.2710 50.5606 50.8634 (39)
 50.4135

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 HLP (average) 0.8189 0.8163 0.8137 0.8015 0.7992 0.7886 0.7886 0.7867 0.7927 0.7992 0.8038 0.8086 (40)
 Days in mont 31 28 31 30 31 30 31 31 30 31 30 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0623 (42)
 Hot water usage for mixer showers 58.7981 57.9145 56.6268 54.1632 52.3452 50.3177 49.1652 50.4431 51.8439 54.0208 56.5373 58.5728 (42a)
 Hot water usage for baths 25.4083 25.0310 24.4996 23.5198 22.7862 21.9727 21.5332 22.0609 22.6355 23.5059 24.5059 25.3224 (42b)
 Hot water usage for other uses 35.7503 34.4503 33.1503 31.8503 30.5503 29.2503 29.2503 30.5503 31.8503 33.1503 34.4503 35.7503 (42c)
 Average daily hot water use (litres/day) 110.2677 (43)
 Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 Energy conte 119.9567 117.3957 114.2767 109.5333 105.6816 101.5406 99.9487 103.0543 106.3296 110.6770 115.4935 119.6455 (44)
 Energy content (annual) 189.9821 167.1700 175.6391 149.9457 142.2677 124.8560 120.8793 127.6027 131.1150 150.1877 164.5417 187.3360 (45)
 Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1831.5229
 28.4973 25.0755 26.3459 22.4918 21.3402 18.7284 18.1319 19.1404 19.6673 22.5281 24.6812 28.1004 (46)
 Water storage loss:
 Total storage loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)
 If cylinder contains dedicated solar storage 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)
 Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)
 Combi loss 50.9589 46.0274 50.9589 49.3151 50.9589 49.3151 50.9328 50.9589 49.3151 50.9589 49.3151 50.9589 (61)
 Total heat required for water heating calculated for each month
 240.9410 213.1974 226.5980 199.2607 193.2266 174.1710 171.8121 178.5616 180.4301 201.1466 213.8567 238.2949 (62)
 WWHRs -26.8800 -23.7729 -24.8936 -20.6129 -19.2105 -16.4386 -15.4085 -16.3854 -17.0080 -20.0505 -22.7148 -26.3822 (63a)
 PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 (63b)
 Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)
 FGHRs 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)
 Output from w/h 214.0610 189.4244 201.7044 178.6478 174.0161 157.7325 156.4036 162.1762 163.4221 181.0960 191.1419 211.9127 (64)
 Total per year (kWh/year) = Sum(64)m = 2181.7388 (64)
 2182 (64)
 12Total per year (kWh/year)
 Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
 Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
 Heat gains from water heating, kWh/month 75.9088 67.0909 71.1397 62.1857 60.0437 53.8434 52.9256 55.1676 55.9245 62.6771 67.0389 75.0289 (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
 103.1165 103.1165 103.1165 103.1165 103.1165 103.1165 103.1165 103.1165 103.1165 103.1165 103.1165 103.1165 (66)
 Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
 92.6284 102.5529 92.6284 95.7160 92.6284 95.7160 92.6284 92.6284 95.7160 92.6284 95.7160 92.6284 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
 180.1971 182.0670 177.3549 167.3236 154.6607 142.7595 134.8087 132.9388 137.6509 147.6822 160.3451 172.2463 (68)
 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
 33.3116 33.3116 33.3116 33.3116 33.3116 33.3116 33.3116 33.3116 33.3116 33.3116 33.3116 33.3116 (69)
 Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 0.0000 0.0000 0.0000 0.0000 3.0000 3.0000 3.0000 (70)
 Losses e.g. evaporation (negative values) (Table 5)
 -82.4932 -82.4932 -82.4932 -82.4932 -82.4932 -82.4932 -82.4932 -82.4932 -82.4932 -82.4932 -82.4932 -82.4932 (71)
 Water heating gains (Table 5)
 102.0279 99.8376 95.6179 86.3690 80.7040 74.7825 71.1365 74.1500 77.6729 84.2434 93.1095 100.8454 (72)
 Total internal gains 431.7884 441.3924 422.5362 406.3435 384.9280 367.1929 352.5085 353.6522 364.9747 381.4890 406.1055 422.6550 (73)

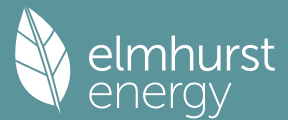
6. Solar gains

[Jan] Area Solar flux g FF Access Gains
 m2 Table 6a W/m2 Specific data or Table 6b Specific data or Table 6c factor Table 6d W
 North 11.4800 10.6334 0.6300 0.7000 0.7700 37.3066 (74)
 Solar gains 37.3066 71.2948 121.1473 194.5936 262.1354 280.6237 261.9981 207.8621 145.6583 84.8671 46.0225 31.1006 (83)
 Total gains 469.0949 512.6872 543.6835 600.9371 647.0634 647.8166 614.5067 561.5143 510.6330 466.3562 452.1280 453.7556 (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 80.4611 80.7216 80.9785 82.2076 82.4417 83.5492 83.5492 83.7576 83.1191 82.4417 81.9694 81.4815
 alpha 6.3641 6.3814 6.3986 6.4805 6.4961 6.5699 6.5699 6.5838 6.5413 6.4961 6.4646 6.4321
 util living area 0.9903 0.9814 0.9594 0.8727 0.6959 0.4877 0.3549 0.4047 0.6563 0.9107 0.9786 0.9919 (86)

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MIT	20.2502	20.3867	20.5817	20.8373	20.9672	20.9971	20.9997	20.9993	20.9830	20.8133	20.5051	20.2319 (87)
Th 2	20.2370	20.2393	20.2415	20.2520	20.2540	20.2632	20.2632	20.2649	20.2597	20.2540	20.2500	20.2459 (88)
util rest of house	0.9876	0.9765	0.9486	0.8443	0.6481	0.4326	0.2956	0.3404	0.5927	0.8832	0.9720	0.9897 (89)
MIT 2	19.3673	19.5411	19.7850	20.0935	20.2280	20.2616	20.2631	20.2646	20.2487	20.0747	19.7001	19.3513 (90)
Living area fraction									fLA = Living area / (4) =			0.4119 (91)
MIT	19.7310	19.8894	20.1132	20.3999	20.5325	20.5646	20.5665	20.5673	20.5511	20.3790	20.0317	19.7141 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7310	19.8894	20.1132	20.3999	20.5325	20.5646	20.5665	20.5673	20.5511	20.3790	20.0317	19.7141 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9854	0.9737	0.9465	0.8503	0.6664	0.4553	0.3201	0.3669	0.6182	0.8883	0.9697	0.9877 (94)
Useful gains	462.2490	499.2022	514.6149	510.9643	431.1893	294.9349	196.6824	206.0236	315.6878	414.2664	438.4060	448.1753 (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	794.8257	769.5895	696.7125	579.7571	444.0201	295.8707	196.7578	206.2020	321.6624	491.5987	653.8357	789.0979 (97)
Space heating kWh	247.4371	181.7003	135.4806	49.5308	9.5461	0.0000	0.0000	0.0000	0.0000	57.5352	155.1094	253.6464 (98a)
Space heating requirement - total per year (kWh/year)												1089.9860
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	247.4371	181.7003	135.4806	49.5308	9.5461	0.0000	0.0000	0.0000	0.0000	57.5352	155.1094	253.6464 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1089.9860
Space heating per m2										(98c) / (4) =		17.3289 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	247.4371	181.7003	135.4806	49.5308	9.5461	0.0000	0.0000	0.0000	0.0000	57.5352	155.1094	253.6464 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	267.7891	196.6454	146.6240	53.6048	10.3313	0.0000	0.0000	0.0000	0.0000	62.2676	167.8673	274.5091 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	214.0610	189.4244	201.7044	178.6478	174.0161	157.7325	156.4036	162.1762	163.4221	181.0960	191.1419	211.9127 (64)
Efficiency of water heater (217)m	84.6928	84.2923	83.5474	82.0224	80.7060	80.3000	80.3000	80.3000	80.3000	82.2176	83.9375	84.7677 (216)
Fuel for water heating, kWh/month	252.7500	224.7234	241.4250	217.8037	215.6173	196.4290	194.7741	201.9629	203.5145	220.2642	227.7194	249.9923 (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	19.2463	15.4401	13.9021	10.1853	7.8674	6.4277	7.1769	9.3288	12.1172	15.8985	17.9573	19.7813 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-16.9225	-25.1090	-37.9659	-44.9832	-50.5355	-47.9248	-47.3510	-43.6973	-37.6023	-29.7204	-19.0471	-14.4889 (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	-6.1020	-13.1192	-26.6070	-40.7500	-54.6544	-55.1893	-54.5295	-45.8059	-33.1065	-19.0062	-8.2256	-4.8038 (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												1179.6385 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2646.9759 (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)												155.3291 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-777.2475 (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												3290.6960 (238)

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

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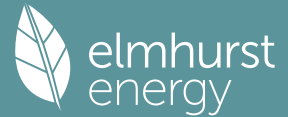


	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1179.6385	0.2100	247.7241 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2646.9759	0.2100	555.8649 (264)
Space and water heating			803.5890 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	155.3291	0.1443	22.4188 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.3479	0.1335	-55.4562
PV Unit electricity exported	-361.8996	0.1253	-45.3578
Total			-100.8140 (269)
Total CO2, kg/year			737.1231 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7200 (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	1179.6385	1.1300	1332.9915 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2646.9759	1.1300	2991.0828 (278)
Space and water heating			4324.0743 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	155.3291	1.5338	238.2489 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.3479	1.4934	-620.2793
PV Unit electricity exported	-361.8996	0.4600	-166.4848
Total			-786.7641 (283)
Total Primary energy kWh/year			3905.6599 (286)
Target Primary Energy Rate (TPER)			62.0900 (287)

Full SAP Calculation Printout



Property Reference	Baseline			Issued on Date	06/01/2025
Assessment Reference	FF-Unit 16 (Block A)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	83 B	DER	18.42	TER	14.98
Environmental	86 B	% DER < TER			-22.96
CO ₂ Emissions (t/year)	1.05	DFEE	34.03	TFEE	36.98
Compliance Check	See BREL	% DFEE < TFEE			7.97
% DPER < TPER	-28.39	DPER	102.26	TPER	79.65
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	60.4500 (1b)	2.4000 (2b)	145.0800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.4500		145.0800 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	145.0800 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1379 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3879 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3297 (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	0.4203	0.4121	0.4039	0.3626	0.3544	0.3132	0.3132	0.3050	0.3297	0.3544	0.3709	0.3874 (22b)
Effective ac	0.5883	0.5849	0.5815	0.5658	0.5628	0.5490	0.5490	0.5465	0.5543	0.5628	0.5688	0.5750 (25)

3. Heat losses and heat loss parameter

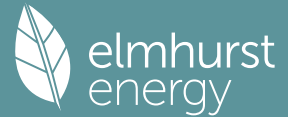
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.20)			11.1100	1.1450	12.7214		(27)
External Wall	38.1400	11.1100	27.0300	0.1800	4.8654	70.0000	1892.1000 (29a)
External Roof	60.4500		60.4500	0.1000	6.0450	9.0000	544.0500 (30)
Total net area of external elements A _{um} (A, m ²)			98.5900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	23.6318			(33)
Party Wall			38.1400	0.0000	0.0000	180.0000	6865.2000 (32)
Party Floor			60.4500			40.0000	2418.0000 (32d)
Internal Wall			98.7800			9.0000	889.0200 (32c)

Heat capacity C_m = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12608.3700 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 208.5752 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.0000	0.3000	1.8000
E3 Sill	3.2000	0.0400	0.1280
E4 Jamb	21.8000	0.0500	1.0900
E7 Party floor between dwellings (in blocks of flats)	11.9000	0.0700	0.8330
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.8900	0.0000	0.0000
E18 Party wall between dwellings	4.8000	0.0600	0.2880
E9 Balcony between dwellings, wall insulation continuous	3.0000	0.0200	0.0600

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E16 Corner (normal)	2.4000	0.0900	0.2160
E15 Flat roof with parapet	15.8900	0.2800	4.4492
P4 Party wall - Roof (insulation at ceiling level)	15.8900	0.1200	1.9068
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.7710 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	34.4028 (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	28.1677	28.0035	27.8425	27.0863	26.9449	26.2863	26.1643	26.5400	26.9449	27.2311	27.5303	(38)
Heat transfer coeff	62.5705	62.4062	62.2452	61.4891	61.3476	60.6891	60.6891	60.5671	60.9427	61.3476	61.6338	(39)
Average = Sum(39)m / 12 =												61.4884
HLP	1.0351	1.0324	1.0297	1.0172	1.0148	1.0040	1.0040	1.0019	1.0082	1.0148	1.0196	(40)
HLP (average)												1.0172
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9943 (42)
Hot water usage for mixer showers												64.6166 (42a)
Hot water usage for baths												24.8338 (42b)
Hot water usage for other uses												35.0539 (42c)
Average daily hot water use (litres/day)												114.7736 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	124.8371	122.2175	119.0012	114.0479	110.0480	105.7388	104.0365	107.2384	110.6219	115.1518	120.1833	124.5043 (44)
Energy content (annual)	197.7114	174.0361	182.9005	156.1258	148.1458	130.0182	125.8232	132.7836	136.4078	156.2599	171.2232	194.9437 (45)
Distribution loss (46)m = 0.15 x (45)m												1906.3792
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	248.6703	220.0635	233.8594	205.4409	199.1047	179.3333	176.7821	183.7425	185.7229	207.2188	220.5383	245.9026 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	248.6703	220.0635	233.8594	205.4409	199.1047	179.3333	176.7821	183.7425	185.7229	207.2188	220.5383	245.9026 (64)
12Total per year (kWh/year)												2506.3792 (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	78.4788	69.3739	73.5541	64.2406	61.9982	55.5598	54.5759	56.8903	57.6844	64.6961	69.2605	77.5585 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	91.5122	101.3171	91.5122	94.5626	91.5122	94.5626	91.5122	91.5122	94.5626	91.5122	94.5626	91.5122 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.0804	175.8868	171.3347	161.6438	149.4109	137.9136	130.2327	128.4263	132.9784	142.6693	154.9022	166.3995 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716 (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)	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732 (71)
Water heating gains (Table 5)	105.4822	103.2349	98.8631	89.2231	83.3309	77.1664	73.3547	76.4654	80.1172	86.9572	96.1951	104.2453 (72)
Total internal gains	426.9898	436.3538	417.6250	401.3445	380.1689	362.5576	348.0146	349.3188	360.5731	377.0536	401.5749	418.0720 (73)

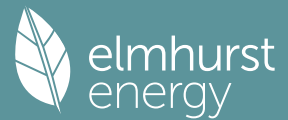
6. Solar gains

[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				7.0400	10.6334	0.5700	0.7000	0.7700				20.6991 (74)
East				4.0700	19.6403	0.5700	0.7000	0.7700				22.1028 (76)
Solar gains	42.8019	82.7948	138.4235	211.8181	272.7150	285.9865	269.4039	221.8761	163.6327	98.3927	53.0946	35.4320 (83)
Total gains	469.7917	519.1486	556.0484	613.1626	652.8839	648.5441	617.4185	571.1950	524.2058	475.4463	454.6695	453.5040 (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)												
tau	55.9741	56.1214	56.2665	56.9585	57.0898	57.7093	57.7093	57.8255	57.4691	57.0898	56.8247	56.5502

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alpha	4.7316	4.7414	4.7511	4.7972	4.8060	4.8473	4.8473	4.8550	4.8313	4.8060	4.7883	4.7700
util living area	0.9873	0.9784	0.9590	0.8969	0.7677	0.5778	0.4282	0.4800	0.7266	0.9243	0.9768	0.9892 (86)
MIT	19.7850	19.9606	20.2269	20.5926	20.8544	20.9712	20.9945	20.9907	20.9166	20.5830	20.1344	19.7596 (87)
Th 2	20.0542	20.0565	20.0587	20.0690	20.0710	20.0800	20.0800	20.0817	20.0765	20.0710	20.0670	20.0629 (88)
util rest of house	0.9841	0.9729	0.9483	0.8708	0.7161	0.5028	0.3408	0.3879	0.6533	0.8992	0.9699	0.9864 (89)
MIT 2	18.9597	19.1342	19.3958	19.7483	19.9744	20.0664	20.0784	20.0787	20.0308	19.7486	19.3155	18.9415 (90)
Living area fraction	19.3224	19.4974	19.7611	20.1194	20.3612	20.4641	20.4811	20.4796	20.4202	20.1154	19.6754	19.3011 (92)
MIT												0.4395 (91)
Temperature adjustment												0.0000
adjusted MIT	19.3224	19.4974	19.7611	20.1194	20.3612	20.4641	20.4811	20.4796	20.4202	20.1154	19.6754	19.3011 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9808	0.9689	0.9443	0.8724	0.7331	0.5348	0.3793	0.4283	0.6821	0.9006	0.9663	0.9834 (94)
Useful gains	460.7946	502.9859	525.0809	534.9277	478.6554	346.8584	234.1693	244.6710	357.5423	428.1924	439.3540	445.9922 (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	939.9606	910.9718	825.4406	689.8699	531.3433	355.8863	235.5379	247.0868	385.1682	583.7452	775.0729	935.2541 (97)
Space heating kWh	356.4995	274.1665	223.4676	111.5584	39.1998	0.0000	0.0000	0.0000	0.0000	115.7312	241.7176	364.0109 (98a)
Space heating requirement - total per year (kWh/year)												1726.3516
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	356.4995	274.1665	223.4676	111.5584	39.1998	0.0000	0.0000	0.0000	0.0000	115.7312	241.7176	364.0109 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1726.3516
Space heating per m2										(98c) / (4) =		28.5583 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												83.0000 (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	356.4995	274.1665	223.4676	111.5584	39.1998	0.0000	0.0000	0.0000	0.0000	115.7312	241.7176	364.0109 (98)
Space heating efficiency (main heating system 1)	83.0000	83.0000	83.0000	83.0000	83.0000	0.0000	0.0000	0.0000	0.0000	83.0000	83.0000	83.0000 (210)
Space heating fuel (main heating system)	429.5175	330.3211	269.2381	134.4077	47.2287	0.0000	0.0000	0.0000	0.0000	139.4352	291.2260	438.5673 (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	248.6703	220.0635	233.8594	205.4409	199.1047	179.3333	176.7821	183.7425	185.7229	207.2188	220.5383	245.9026 (64)
Efficiency of water heater (217)m	84.2503	83.9512	83.3818	82.2280	80.6973	79.4000	79.4000	79.4000	79.4000	82.2816	83.6761	79.4000 (216)
Fuel for water heating, kWh/month	295.1566	262.1326	280.4683	249.8430	246.7304	225.8605	222.6474	231.4137	233.9079	251.8410	263.5620	84.3179 (217)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	20.1209	16.1418	14.5339	10.6481	8.2249	6.7198	7.5030	9.7527	12.6679	16.6209	18.7733	20.6801 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2079.9417 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.4000
Water heating fuel used												3055.2009 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												162.3874 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												5383.5300 (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	2079.9417	0.2100	436.7878	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3055.2009	0.2100	641.5922	(264)
Space and water heating			1078.3799	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	162.3874	0.1443	23.4375	(268)
Total CO2, kg/year			1113.7467	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			18.4200	(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	2079.9417	1.1300	2350.3342	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3055.2009	1.1300	3452.3770	(278)
Space and water heating			5802.7111	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	162.3874	1.5338	249.0752	(282)
Total Primary energy kWh/year			6181.8871	(286)
Dwelling Primary energy Rate (DPER)			102.2600	(287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	60.4500	(1b) x 2.4000 (2b)	= 145.0800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.4500			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.0800	(5)

2. Ventilation rate

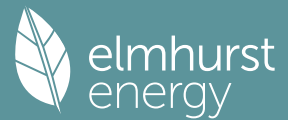
	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
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) = 0.1379 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3879 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3297 (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	0.4203	0.4121	0.4039	0.3626	0.3544	0.3132	0.3132	0.3050	0.3297	0.3544	0.3709	0.3874 (22b)
Effective ac	0.5883	0.5849	0.5815	0.5658	0.5628	0.5490	0.5490	0.5465	0.5543	0.5628	0.5688	0.5750 (25)

3. Heat losses and heat loss parameter

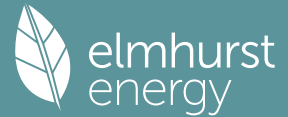
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			11.1100	1.1450	12.7214			(27)
External Wall	38.1400	11.1100	27.0300	0.1800	4.8654			(29a)
External Roof	60.4500		60.4500	0.1100	6.6495			(30)
Total net area of external elements Aum(A, m2)			98.5900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.2363			(33)
Party Wall			38.1400	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.5752	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				6.0000	0.0500	0.3000		

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E3 Sill						3.2000		0.0500		0.1600		
E4 Jamb						21.8000		0.0500		1.0900		
E7 Party floor between dwellings (in blocks of flats)						11.9000		0.0700		0.8330		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)						15.8900		0.0000		0.0000		
E18 Party wall between dwellings						4.8000		0.0600		0.2880		
E9 Balcony between dwellings, wall insulation continuous						3.0000		0.0200		0.0600		
E16 Corner (normal)						2.4000		0.0900		0.2160		
E15 Flat roof with parapet						15.8900		0.5600		8.8984		
P4 Party wall - Roof (insulation at ceiling level)						15.8900		0.1200		1.9068		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											13.7522	(36)
Point Thermal Bridges											0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	37.9885 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	28.1677	28.0035	27.8425	27.0863	26.9449	26.2863	26.2863	26.1643	26.5400	26.9449	27.2311	27.5303 (38)
Average = Sum(39)m / 12 =	66.1562	65.9919	65.8309	65.0748	64.9333	64.2748	64.2748	64.1528	64.5284	64.9333	65.2195	65.5187 (39)
												65.0741
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0944	1.0917	1.0890	1.0765	1.0742	1.0633	1.0633	1.0613	1.0675	1.0742	1.0789	1.0839 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												1.0765
												31
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.9943 (42)
Hot water usage for mixer showers												
	57.6579	56.7914	55.5288	53.1130	51.3301	49.3419	48.2118	49.4649	50.8385	52.9733	55.4410	57.4370 (42a)
Hot water usage for baths												
	24.9180	24.5479	24.0268	23.0659	22.3464	21.5486	21.1177	21.6352	22.1987	23.0523	24.0330	24.8338 (42b)
Hot water usage for other uses												
	35.0539	33.7792	32.5045	31.2299	29.9552	28.6805	28.6805	29.9552	31.2299	32.5045	33.7792	35.0539 (42c)
Average daily hot water use (litres/day)												108.1288 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	117.6298	115.1186	112.0601	107.4088	103.6317	99.5711	98.0100	101.0553	104.2671	108.5301	113.2532	117.3247 (44)
Energy conte	186.2969	163.9274	172.2323	147.0372	139.5082	122.4342	118.5347	125.1276	128.5717	147.2744	161.3500	183.7021 (45)
Energy content (annual)												Total = Sum(45)m =
Distribution loss (46)m = 0.15 x (45)m												1795.9966
	27.9445	24.5891	25.8348	22.0556	20.9262	18.3651	17.7802	18.7691	19.2858	22.0912	24.2025	27.5553 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.1035	49.9448	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	237.2558	209.9548	223.1912	196.3523	190.4672	171.5378	168.4795	176.0865	177.8868	198.2333	210.6650	234.6610 (62)
WWHRS	-26.3588	-23.3119	-24.4109	-20.2132	-18.8380	-16.1198	-15.1097	-16.0677	-16.6782	-19.6617	-22.2743	-25.8707 (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	210.8970	186.6428	198.7803	176.1391	171.6292	155.4180	153.3698	160.0188	161.2086	178.5716	188.3907	208.7904 (64)
12Total per year (kWh/year)												2149.8562 (64)
Electric shower(s)												2150 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month												
	74.6835	66.0127	70.0070	61.2186	59.1262	52.9853	51.8990	54.3446	55.0789	61.7085	65.9776	73.8207 (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
	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	89.3894	98.9668	89.3894	92.3690	89.3894	92.3690	89.3894	89.3894	92.3690	89.3894	92.3690	89.3894 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	174.0804	175.8868	171.3347	161.6438	149.4109	137.9136	130.2327	128.4263	132.9784	142.6693	154.9022	166.3995 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732 (71)
Water heating gains (Table 5)												
	100.3810	98.2332	94.0954	85.0259	79.4707	73.5907	69.7567	73.0439	76.4984	82.9415	91.6356	99.2213 (72)
Total internal gains												
	419.7657	429.0017	410.7344	394.9537	374.1859	356.7882	342.2937	343.7745	354.7607	370.9150	394.8218	410.9252 (73)
6. Solar gains												
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
North	7.0400											22.8779 (74)
East	4.0700											24.4294 (76)
Solar gains	47.3073	91.5100	152.9944	234.1148	301.4218	316.0904	297.7622	245.2315	180.8572	108.7498	58.6835	39.1617 (83)
Total gains	467.0730	520.5118	563.7288	629.0685	675.6077	672.8786	640.0559	589.0060	535.6179	479.6649	453.5053	450.0869 (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	52.9403	53.0720	53.2018	53.8200	53.9372	54.4899	54.4899	54.5935	54.2757	53.9372	53.7006	53.4553
alpha	4.5294	4.5381	4.5468	4.5880	4.5958	4.6327	4.6327	4.6396	4.6184	4.5958	4.5800	4.5637
util living area	0.9882	0.9796	0.9605	0.8996	0.7724	0.5854	0.4362	0.4907	0.7388	0.9295	0.9786	0.9899 (86)
MIT	19.6719	19.8584	20.1462	20.5409	20.8298	20.9637	20.9925	20.9873	20.8971	20.5242	20.0414	19.6443 (87)
Th 2	20.0054	20.0076	20.0098	20.0201	20.0220	20.0309	20.0309	20.0326	20.0275	20.0220	20.0181	20.0140 (88)
util rest of house	0.9851	0.9743	0.9499	0.8734	0.7194	0.5065	0.3429	0.3924	0.6633	0.9051	0.9721	0.9873 (89)
MIT 2	18.4717	18.7091	19.0713	19.5567	19.8775	20.0090	20.0282	20.0275	19.9550	19.5493	18.9504	18.4428 (90)
Living area fraction									fLA = Living area /	(4) =		0.4395 (91)
MIT	18.9992	19.2143	19.5437	19.9893	20.2961	20.4286	20.4520	20.4494	20.3691	19.9778	19.4299	18.9709 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9992	19.2143	19.5437	19.9893	20.2961	20.4286	20.4520	20.4494	20.3691	19.9778	19.4299	18.9709 (93)

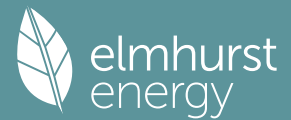
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9809	0.9688	0.9439	0.8724	0.7352	0.5398	0.3839	0.4355	0.6915	0.9038	0.9670	0.9835 (94)
Useful gains	458.1561	504.2801	532.0863	548.8231	496.7187	363.1952	245.7145	256.4915	370.4027	433.5142	438.5447	442.6660 (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	972.4450	944.6250	858.6805	721.6340	558.1708	374.6336	247.5871	259.7790	404.5365	608.9294	804.1529	967.7691 (97)
Space heating kWh	382.6310	295.9118	242.9860	124.4238	45.7203	0.0000	0.0000	0.0000	0.0000	130.5089	263.2379	390.6767 (98a)
Space heating requirement - total per year (kWh/year)												1876.0965
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	382.6310	295.9118	242.9860	124.4238	45.7203	0.0000	0.0000	0.0000	0.0000	130.5089	263.2379	390.6767 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1876.0965
Space heating per m2										(98c) / (4) =		31.0355 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	382.6310	295.9118	242.9860	124.4238	45.7203	0.0000	0.0000	0.0000	0.0000	130.5089	263.2379	390.6767 (98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)	
Space heating fuel (main heating system)	414.1028	320.2509	262.9719	134.6578	49.4809	0.0000	0.0000	0.0000	0.0000	141.2434	284.8895	422.8103 (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	210.8970	186.6428	198.7803	176.1391	171.6292	155.4180	153.3698	160.0188	161.2086	178.5716	188.3907	208.7904 (64)	
Efficiency of water heater	85.6409	85.3639	84.8128	83.6499	81.9680	80.3000	80.3000	80.3000	80.3000	83.7197	85.0983	85.7031 (216)	
Fuel for water heating, kWh/month	246.2573	218.6437	234.3753	210.5670	209.3856	193.5467	190.9960	199.2762	200.7579	213.2968	221.3802	243.6205 (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	18.5733	14.9002	13.4160	9.8291	7.5923	6.2030	6.9260	9.0026	11.6935	15.3425	17.3293	19.0896 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-16.2835	-24.1718	-36.5663	-43.3478	-48.7209	-46.2151	-45.6646	-42.1315	-36.2387	-28.6234	-18.3326	-13.9408 (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)	-5.8442	-12.5674	-25.4916	-39.0460	-52.3718	-52.8826	-52.2476	-43.8856	-31.7159	-18.2053	-7.8779	-4.6005 (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													2030.4074 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													2582.1032 (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)													149.8975 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-746.9732 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)

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Appendix Q - special features

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4101.4350 (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	2030.4074	0.2100	426.3856 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2582.1032	0.2100	542.2417 (264)
Space and water heating			968.6272 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	149.8975	0.1443	21.6348 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-400.2369	0.1335	-53.4340
PV Unit electricity exported	-346.7362	0.1253	-43.4567
Total			-96.8907 (269)
Total CO2, kg/year			905.3006 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.9800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2030.4074	1.1300	2294.3604 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2582.1032	1.1300	2917.7766 (278)
Space and water heating			5212.1370 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	149.8975	1.5338	229.9178 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-400.2369	1.4934	-597.6954
PV Unit electricity exported	-346.7362	0.4600	-159.5068
Total			-757.2022 (283)
Total Primary energy kWh/year			4814.9535 (286)
Target Primary Energy Rate (TPER)			79.6500 (287)

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Property Reference	Baseline			Issued on Date	06/01/2025
Assessment Reference	GF-Unit 1 (Block B)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	82 B	DER	21.02	TER	15.76
Environmental	87 B	% DER < TER			-33.38
CO ₂ Emissions (t/year)	0.77	DFEE	30.03	TFEE	27.98
Compliance Check	See BREL	% DFEE < TFEE			-7.31
% DPER < TPER	-38.46	DPER	116.92	TPER	84.44
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	38.5900 (1b)	2.5000 (2b)	96.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.5900		96.4750 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	96.4750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.2073 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4573 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3887 (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	0.4956	0.4859	0.4762	0.4276	0.4179	0.3693	0.3693	0.3596	0.3887	0.4179	0.4373	0.4567 (22b)
Effective ac	0.6228	0.6180	0.6134	0.5914	0.5873	0.5682	0.5682	0.5646	0.5755	0.5873	0.5956	0.6043 (25)

3. Heat losses and heat loss parameter

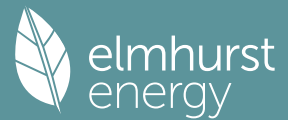
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.20)			6.1600	1.1450	7.0534		(27)
Heatloss Floor			38.5900	0.1000	3.8590	110.0000	4244.9000 (28a)
External Wall	34.7500	6.1600	28.5900	0.1800	5.1462	70.0000	2001.3000 (29a)
Total net area of external elements A _{um} (A, m ²)			73.3400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	16.0586			(33)
Party Wall			34.7500	0.0000	0.0000	180.0000	6255.0000 (32)
Party Ceiling			38.5900			30.0000	1157.7000 (32b)
Internal Wall			66.3000			9.0000	596.7000 (32c)

Heat capacity C_m = Sum(A x k)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 14255.6000 (34)
369.4118 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	3.7500	0.3000	1.1250
E3 Sill	2.8000	0.0400	0.1120
E4 Jamb	13.0000	0.0500	0.6500
E5 Ground floor (normal)	13.9000	0.1600	2.2240
E7 Party floor between dwellings (in blocks of flats)	13.9000	0.0700	0.9730
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	5.0000	0.0600	0.3000

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P1 Party wall - Ground floor	13.9000	0.1600	2.2240	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.9000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.8330 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =		23.8916 (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	19.8283	19.6765	19.5277	18.8287	18.6979	18.0891	18.0891	17.9763	18.3236	18.6979	18.9625	19.2391 (38)
Average = Sum(39)m / 12 =	43.7200	43.5682	43.4193	42.7203	42.5895	41.9807	41.9807	41.8680	42.2152	42.5895	42.8541	43.1307 (39)
												42.7197
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1329	1.1290	1.1251	1.1070	1.1036	1.0879	1.0879	1.0849	1.0939	1.1036	1.1105	1.1177 (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												1.3694 (42)
Hot water usage for mixer showers												
53.0769	52.2793	51.1169	48.8931	47.2519	45.4217	44.3814	45.5349	46.7994	48.7645	51.0361	52.8736	(42a)
Hot water usage for baths												
21.4863	21.1672	20.7178	19.8893	19.2689	18.5809	18.2093	18.6556	19.1414	19.8775	20.7231	21.4136	(42b)
Hot water usage for other uses												
30.1620	29.0652	27.9684	26.8716	25.7748	24.6780	24.6780	25.7748	26.8716	27.9684	29.0652	30.1620	(42c)
Average daily hot water use (litres/day)												96.2763 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
104.7252	102.5116	99.8031	95.6539	92.2955	88.6806	87.2687	89.9652	92.8123	96.6104	100.8244	104.4492	(44)
Energy conte	165.8590	145.9752	153.3937	130.9454	124.2475	109.0431	105.5439	111.3957	114.4469	131.0993	143.6429	163.5421 (45)
Energy content (annual)										Total = Sum(45)m =		1599.1348
Distribution loss (46)m = 0.15 x (45)m												
24.8789	21.8963	23.0091	19.6418	18.6371	16.3565	15.8316	16.7094	17.1670	19.6649	21.5464	24.5313	(46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(59)
Combi loss	50.9589	46.0274	50.8586	47.1718	47.0328	43.7329	44.4712	45.8453	45.7705	49.3151	49.3151	(61)
Total heat required for water heating calculated for each month												
216.8180	192.0026	204.2523	178.1172	171.2803	152.7760	150.0151	157.2410	160.2174	180.3309	192.9579	214.5010	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	(63c)
FGHRS	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	216.8180	192.0026	204.2523	178.1172	171.2803	152.7760	150.0151	157.2410	160.2174	180.3309	192.9579	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2170.5096 (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	(64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	67.8879	60.0436	63.7180	55.3323	53.0705	47.1901	46.2111	48.5004	49.4962	55.8984	60.0900	(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	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
63.8861	70.7310	63.8861	66.0156	63.8861	66.0156	63.8861	63.8861	66.0156	63.8861	66.0156	63.8861	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
118.0043	119.2288	116.1431	109.5739	101.2815	93.4878	88.2812	87.0566	90.1424	96.7116	105.0040	112.7976	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	(71)
Water heating gains (Table 5)												
91.2471	89.3506	85.6425	76.8504	71.3313	65.5417	62.1117	65.1887	68.7447	75.1323	83.4584	90.2117	(72)
Total internal gains	319.6783	325.8512	312.2125	298.9807	283.0397	268.5859	257.8197	259.6722	268.4435	282.2707	301.0187	313.4362 (73)

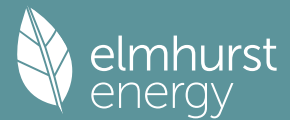
6. Solar gains

[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			
South				6.1600	46.7521	0.5700	0.7000	0.7700	79.6320 (78)			
Solar gains	79.6320	130.4167	166.1277	187.7604	195.6580	188.2942	183.9749	178.6651	173.5400	140.6666	94.3911	68.8094 (83)
Total gains	399.3103	456.2679	478.3402	486.7411	478.6976	456.8801	441.7946	438.3373	441.9835	422.9373	395.4098	382.2455 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	90.5739	90.8895	91.2011	92.6933	92.9780	94.3264	94.3264	94.5804	93.8024	92.9780	92.4040	91.8114
util living area	7.0383	7.0593	7.0801	7.1796	7.1985	7.2884	7.2884	7.3054	7.2535	7.1985	7.1603	7.1208

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	0.9935	0.9827	0.9615	0.9025	0.7811	0.5829	0.4177	0.4388	0.6478	0.8973	0.9815	0.9950 (86)
MIT	20.3262	20.4882	20.6567	20.8425	20.9550	20.9952	20.9996	20.9995	20.9899	20.8713	20.5792	20.3028 (87)
Th 2	19.9740	19.9772	19.9804	19.9951	19.9979	20.0108	20.0108	20.0131	20.0058	19.9979	19.9923	19.9864 (88)
util rest of house												
	0.9906	0.9754	0.9456	0.8658	0.7145	0.4956	0.3240	0.3450	0.5602	0.8525	0.9723	0.9927 (89)
MIT 2	19.3885	19.5488	19.7113	19.8885	19.9748	20.0093	20.0107	20.0131	20.0023	19.9173	19.6516	19.3761 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.7809	19.9420	20.1069	20.2877	20.3850	20.4219	20.4246	20.4259	20.4156	20.3166	20.0398	19.7639 (91)
Temperature adjustment												0.0000 (92)
adjusted MIT	19.7809	19.9420	20.1069	20.2877	20.3850	20.4219	20.4246	20.4259	20.4156	20.3166	20.0398	19.7639 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9899	0.9751	0.9478	0.8775	0.7415	0.5323	0.3633	0.3843	0.5970	0.8683	0.9728	0.9921	(94)
Useful gains	395.2600	444.8969	453.3928	427.1229	354.9497	243.2126	160.4941	168.4587	263.8670	367.2160	384.6553	379.2296	(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	676.8247	655.3516	590.8045	486.4880	369.8918	244.4090	160.5580	168.5551	266.6141	413.8242	554.5250	671.2826	(97)
Space heating kWh	209.4841	141.4255	102.2343	42.7429	11.1169	0.0000	0.0000	0.0000	0.0000	34.6764	122.3062	217.2874	(98a)
Space heating requirement - total per year (kWh/year)												881.2738	
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	209.4841	141.4255	102.2343	42.7429	11.1169	0.0000	0.0000	0.0000	0.0000	34.6764	122.3062	217.2874	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												881.2738	
Space heating per m2										(98c) / (4) =		22.8368	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													83.0000 (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	209.4841	141.4255	102.2343	42.7429	11.1169	0.0000	0.0000	0.0000	0.0000	34.6764	122.3062	217.2874	(98)
Space heating efficiency (main heating system 1)	83.0000	83.0000	83.0000	83.0000	83.0000	0.0000	0.0000	0.0000	0.0000	83.0000	83.0000	83.0000	(210)
Space heating fuel (main heating system)	252.3905	170.3922	123.1739	51.4975	13.3939	0.0000	0.0000	0.0000	0.0000	41.7789	147.3568	261.7921	(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	216.8180	192.0026	204.2523	178.1172	171.2803	152.7760	150.0151	157.2410	160.2174	180.3309	192.9579	214.5010	(64)
Efficiency of water heater (217)m	83.4054	82.8336	82.0756	80.9306	79.8758	79.4000	79.4000	79.4000	79.4000	80.6715	82.5289	79.4000	(216)
Fuel for water heating, kWh/month	259.9568	231.7931	248.8588	220.0862	214.4333	192.4131	188.9359	198.0366	201.7851	223.5373	233.8064	256.8666	(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	13.2743	10.6491	9.5883	7.0248	5.4262	4.4332	4.9499	6.4341	8.3573	10.9652	12.3852	13.6432	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1061.7757	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.4000	
Water heating fuel used												2670.5093	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												107.1309	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3925.4159	(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	1061.7757	0.2100	222.9729 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2670.5093	0.2100	560.8070 (264)
Space and water heating			783.7799 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	107.1309	0.1443	15.4623 (268)
Total CO2, kg/year			811.1714 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			21.0200 (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	1061.7757	1.1300	1199.8065 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2670.5093	1.1300	3017.6755 (278)
Space and water heating			4217.4821 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	107.1309	1.5338	164.3209 (282)
Total Primary energy kWh/year			4511.9038 (286)
Dwelling Primary energy Rate (DPER)			116.9200 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	38.5900 (1b)	x 2.5000 (2b)	= 96.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.5900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 96.4750 (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) = 0.2073 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4573 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3887 (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	0.4956	0.4859	0.4762	0.4276	0.4179	0.3693	0.3693	0.3596	0.3887	0.4179	0.4373	0.4567 (22b)
Effective ac	0.6228	0.6180	0.6134	0.5914	0.5873	0.5682	0.5682	0.5646	0.5755	0.5873	0.5956	0.6043 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			6.1600	1.1450	7.0534		(27)
Heatloss Floor			38.5900	0.1300	5.0167		(28a)
External Wall	34.7500	6.1600	28.5900	0.1800	5.1462		(29a)
Total net area of external elements Aum(A, m2)			73.3400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.2163		(33)
Party Wall			34.7500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							379.4118 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				3.7500	0.0500	0.1875	
E3 Sill				2.8000	0.0500	0.1400	
E4 Jamb				13.0000	0.0500	0.6500	

Ventilation heat loss calculated monthly (39)m = 0.33 x (25)m x (5)												
(39)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	19.8283	19.6765	19.5277	18.8287	18.6979	18.0891	18.0891	17.9763	18.3236	18.6979	18.9625	19.2391 (38)
Heat transfer coeff												
	42.8562	42.7044	42.5555	41.8565	41.7257	41.1169	41.1169	41.0042	41.3514	41.7257	41.9903	42.2669 (39)
Average = Sum(39)m / 12 =												41.8559
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.1106	1.1066	1.1028	1.0846	1.0813	1.0655	1.0655	1.0626	1.0716	1.0813	1.0881	1.0953 (40)
HLP (average)												1.0846
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

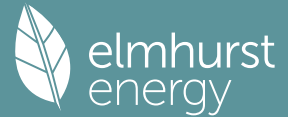
Assumed occupancy													1.3694 (42)
Hot water usage for mixer showers													
47.1795	46.4705	45.4373	43.4605	42.0017	40.3748	39.4501	40.4754	41.5994	43.3462	45.3654	46.9987	(42a)	
Hot water usage for baths													
20.4120	20.1088	19.6819	18.8948	18.3054	17.6519	17.2989	17.7228	18.1843	18.8836	19.6870	20.3429	(42b)	
Hot water usage for other uses													
28.6539	27.6119	26.5700	25.5280	24.4860	23.4441	23.4441	24.4860	25.5280	26.5700	27.6119	28.6539	(42c)	
Average daily hot water use (litres/day)													
												88.4720 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
96.2453	94.1912	91.6892	87.8833	84.7931	81.4708	80.1931	82.6843	85.3118	88.7998	92.6643	95.9955	(44)	
Energy content (annual)	152.4290	134.1270	140.9228	120.3078	114.1478	100.1778	96.9865	102.3804	105.1979	120.5005	132.0173	150.3058 (45)	
Distribution loss (46)m = 0.15 x (45)m													
22.8644	20.1190	21.1384	18.0462	17.1222	15.0267	14.5480	15.3571	15.7797	18.0751	19.8026	22.5459	(46)	
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)	
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	
Combustion loss	49.0456	43.3538	46.7238	43.3397	43.2096	40.1774	40.8655	42.1350	42.0716	45.2514	45.6975	48.9183 (61)	
Total heat required for water heating calculated for each month													
201.4746	177.4807	187.6466	163.6475	157.3575	140.3552	137.8520	144.5154	147.2695	165.7519	177.7148	199.2241 (62)		
WWHRS	-21.5685	-19.0753	-19.9746	-16.5398	-15.4145	-13.1903	-12.3638	-13.1476	-13.6472	-16.0885	-18.2263	-21.1691 (63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h													
179.9061	158.4054	167.6720	147.1078	141.9430	127.1649	125.4883	131.3678	133.6223	149.6634	159.4885	178.0550 (64)		
12Total per year (kWh/year)													
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)		
												0.0000 (64a)	
Heat gains from water heating, kWh/month													
62.9440	55.4357	58.5378	50.8373	48.7566	43.3535	42.4644	44.5752	45.4962	51.3793	55.3201	62.2063 (65)		

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.1243	68.7804	62.1243	64.1951	62.1243	64.1951	62.1243	62.1243	64.1951	62.1243	64.1951	62.1243 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	118.0043	119.2288	116.1431	109.5739	101.2815	93.4878	88.2812	87.0566	90.1424	96.7116	105.0040	112.7976 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469 (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)	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754 (71)
Water heating gains (Table 5)	84.6022	82.4935	78.6798	70.6073	65.5330	60.2131	57.0758	59.9129	63.1892	69.0581	76.8335	83.6106 (72)
Total internal gains	311.2716	317.0436	303.4880	290.9171	275.4796	261.4368	251.0220	252.6346	261.0674	274.4348	292.5733	305.0733 (73)

[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
South					6.1600	46.7521		0.6300	0.7000	0.7700		88.0143 (78)
Solar gains	88.0143	144.1448	183.6149	207.5247	216.2535	208.1146	203.3406	197.4719	191.8074	155.4737	104.3270	76.0525 (83)
Total gains	399.2859	461.1884	487.1028	498.4418	491.7331	469.5514	454.3627	450.1066	452.8748	429.9084	396.9003	381.1257 (84)

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)	

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	94.9007	95.2381	95.5712	97.1673	97.4718	98.9151	98.9151	99.1871	98.3541	97.4718	96.8577	96.2238
alpha	7.3267	7.3492	7.3714	7.4778	7.4981	7.5943	7.5943	7.6125	7.5569	7.4981	7.4572	7.4149
util living area	0.9938	0.9819	0.9572	0.8890	0.7566	0.5574	0.3980	0.4187	0.6228	0.8864	0.9812	0.9954 (86)
MIT	20.3682	20.5347	20.7010	20.8740	20.9682	20.9971	20.9998	20.9997	20.9935	20.8948	20.6141	20.3434 (87)
Th 2	19.9922	19.9954	19.9986	20.0134	20.0162	20.0291	20.0291	20.0315	20.0241	20.0162	20.0106	20.0047 (88)
util rest of house	0.9910	0.9741	0.9398	0.8494	0.6896	0.4745	0.3103	0.3308	0.5385	0.8390	0.9718	0.9932 (89)
MIT 2	19.2884	19.4984	19.7017	19.9068	19.9960	20.0281	20.0291	20.0315	20.0213	19.9340	19.6117	19.2673 (90)
Living area fraction	19.7403	19.9321	20.1199	20.3116	20.4029	20.4336	20.4353	20.4367	FLA = Living area / (4) =	20.3361	20.0312	0.4185 (91)
MIT	19.7403	19.9321	20.1199	20.3116	20.4029	20.4336	20.4353	20.4367	20.4282	20.3361	20.0312	19.7177 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7403	19.9321	20.1199	20.3116	20.4029	20.4336	20.4353	20.4367	20.4282	20.3361	20.0312	19.7177 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9901	0.9735	0.9422	0.8624	0.7170	0.5093	0.3470	0.3676	0.5739	0.8559	0.9720	0.9924 (94)
Useful gains	395.3161	448.9879	458.9587	429.8623	352.5487	239.1440	157.6638	165.4691	259.9128	367.9488	385.8001	378.2444 (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	661.7128	641.9373	579.6009	477.6492	363.1341	239.8607	157.6971	165.5207	261.6794	406.2458	542.9858	655.8839 (97)
Space heating kWh	198.1991	129.6620	89.7577	34.4066	7.8755	0.0000	0.0000	0.0000	0.0000	28.4930	113.1737	206.5638 (98a)
Space heating requirement - total per year (kWh/year)												808.1315
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	198.1991	129.6620	89.7577	34.4066	7.8755	0.0000	0.0000	0.0000	0.0000	28.4930	113.1737	206.5638 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												808.1315
Space heating per m2										(98c) / (4) =		20.9415 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	198.1991	129.6620	89.7577	34.4066	7.8755	0.0000	0.0000	0.0000	0.0000	28.4930	113.1737	206.5638 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	214.5012	140.3269	97.1404	37.2366	8.5233	0.0000	0.0000	0.0000	0.0000	30.8366	122.4824	223.5539 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	179.9061	158.4054	167.6720	147.1078	141.9430	127.1649	125.4883	131.3678	133.6223	149.6634	159.4885	178.0550 (64)
Efficiency of water heater (217)m	84.5895	83.9557	83.1030	81.8000	80.7104	80.3000	80.3000	80.3000	80.3000	81.5619	83.6592	84.7005 (216)
Fuel for water heating, kWh/month	212.6815	188.6775	201.7640	179.8384	175.8670	158.3623	156.2743	163.5962	166.4039	183.4967	190.6408	210.2171 (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	12.9082	10.3554	9.3239	6.8311	5.2765	4.3110	4.8134	6.2567	8.1268	10.6628	12.0436	13.2670 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-10.5548	-15.7548	-23.9707	-28.5982	-32.3234	-30.7512	-30.4102	-27.9837	-23.9430	-18.7573	-11.9212	-9.0284 (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)	-3.5710	-7.6987	-15.6457	-24.0003	-32.2120	-32.5107	-32.0949	-26.9277	-19.4378	-11.1372	-4.8110	-2.8079 (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												874.6012 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2187.8198 (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)												104.1765 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-476.8519 (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												2775.7457 (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	874.6012	0.2100	183.6663 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2187.8198	0.2100	459.4422 (264)
Space and water heating			643.1084 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	104.1765	0.1443	15.0359 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-263.9969	0.1334	-35.2086
PV Unit electricity exported	-212.8549	0.1253	-26.6725
Total			-61.8811 (269)
Total CO2, kg/year			608.1925 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.7600 (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	874.6012	1.1300	988.2994 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2187.8198	1.1300	2472.2363 (278)
Space and water heating			3460.5357 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	104.1765	1.5338	159.7895 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-263.9969	1.4928	-394.1034
PV Unit electricity exported	-212.8549	0.4599	-97.9010
Total			-492.0044 (283)
Total Primary energy kWh/year			3258.4216 (286)
Target Primary Energy Rate (TPER)			84.4400 (287)

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Property Reference	Baseline			Issued on Date	06/01/2025
Assessment Reference	GF-Unit 4 (Block A)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	83 B	DER	18.30	TER	13.88
Environmental	86 B	% DER < TER			-31.84
CO ₂ Emissions (t/year)	1.16	DFEE	35.50	TFEE	34.51
Compliance Check	See BREL	% DFEE < TFEE			-2.85
% DPER < TPER	-37.78	DPER	101.58	TPER	73.73
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	67.1100 (1b)	2.5000 (2b)	167.7750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.1100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	167.7750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1192 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3692 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3138 (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	0.4001	0.3923	0.3844	0.3452	0.3374	0.2981	0.2981	0.2903	0.3138	0.3374	0.3531	0.3687 (22b)
Effective ac	0.5801	0.5769	0.5739	0.5596	0.5569	0.5444	0.5444	0.5421	0.5492	0.5569	0.5623	0.5680 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.20)			10.5600	1.1450	12.0916		(27)
Heatloss Floor			67.1100	0.1000	6.7110	110.0000	7382.1000 (28a)
External Wall	67.1100	10.5600	56.5500	0.1800	10.1790	70.0000	3958.5000 (29a)
Total net area of external elements A _{um} (A, m ²)			134.2200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...	(30) + (32) =	28.9816		(33)
Party Wall			42.4500	0.0000	0.0000	180.0000	7641.0000 (32)
Party Ceiling			67.1100			30.0000	2013.3000 (32b)
Internal Wall			112.8500			9.0000	1015.6500 (32c)

Heat capacity C_m = Sum(A x k)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 22010.5500 (34)
327.9772 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.7500	0.3000	1.7250
E3 Sill	4.8000	0.0400	0.1920
E4 Jamb	21.8000	0.0500	1.0900
E5 Ground floor (normal)	16.9900	0.1600	2.7184
E7 Party floor between dwellings (in blocks of flats)	16.9900	0.0700	1.1893
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	5.0000	0.0600	0.3000

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P1 Party wall - Ground floor	16.9900	0.1600	2.7184
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.9900	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.1581 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	39.1397 (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	32.1150	31.9429	31.7742	30.9818	30.8336	30.1435	30.1435	30.0157	30.4093	30.8336	31.1335	31.4470 (38)
Average = Sum(39)m / 12 =	71.2547	71.0826	70.9139	70.1215	69.9733	69.2832	69.2832	69.1554	69.5490	69.9733	70.2732	70.5867 (39)
												70.1208
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0618	1.0592	1.0567	1.0449	1.0427	1.0324	1.0324	1.0305	1.0363	1.0427	1.0471	1.0518 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1740 (42)
Hot water usage for mixer showers	68.2537	67.2280	65.7333	62.8735	60.7631	58.4095	57.0717	58.5551	60.1812	62.7082	65.6294	67.9922 (42a)
Hot water usage for baths	27.5929	27.1832	26.6061	25.5421	24.7453	23.8619	23.3847	23.9577	24.5817	25.5270	26.6129	27.4997 (42b)
Hot water usage for other uses	38.8354	37.4232	36.0110	34.5988	33.1866	31.7744	31.7744	33.1866	34.5988	36.0110	37.4232	38.8354 (42c)
Average daily hot water use (litres/day)												123.8156 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	134.6821	131.8344	128.3504	123.0144	118.6950	114.0458	112.2309	115.6994	119.3616	124.2461	129.6655	134.3273 (44)
Energy content (annual)	213.3035	187.7304	197.2698	168.4006	159.7863	140.2326	135.7335	143.2601	147.1848	168.6008	184.7323	210.3240 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2056.5586
	31.9955	28.1596	29.5905	25.2601	23.9679	21.0349	20.3600	21.4890	22.0777	25.2901	27.7098	31.5486 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	264.2624	233.7578	248.2287	217.7156	210.7452	189.5477	186.6924	194.2190	196.4999	219.5598	234.0473	261.2830 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	264.2624	233.7578	248.2287	217.7156	210.7452	189.5477	186.6924	194.2190	196.4999	219.5598	234.0473	261.2830 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 2656.5586 (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	83.6631	73.9272	78.3319	68.3220	65.8687	58.9561	57.8711	60.3737	61.2677	68.7995	73.7522	82.6725 (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
108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
103.4362	114.5186	103.4362	106.8840	103.4362	106.8840	103.4362	103.4362	106.8840	103.4362	106.8840	103.4362	103.4362 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
190.4603	192.4366	187.4562	176.8535	163.4695	150.8904	142.4868	140.5104	145.4908	156.0935	169.4775	182.0566	182.0566 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699 (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)												
-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588 (71)
Water heating gains (Table 5)												
112.4504	110.0107	105.2849	94.8916	88.5332	81.8835	77.7838	81.1475	85.0941	92.4725	102.4337	111.1189	111.1189 (72)
Total internal gains	464.9564	475.5755	454.7868	437.2387	414.0484	395.2675	379.3162	380.7036	393.0785	410.6117	437.4048	455.2213 (73)

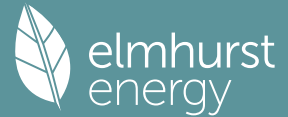
6. Solar gains

[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				3.5200	10.6334		0.5700		0.7000		0.7700	10.3495 (74)
West				7.0400	19.6403		0.5700		0.7000		0.7700	38.2319 (80)
Solar gains	48.5814	94.5682	156.7765	233.6171	292.8685	303.2101	287.2349	241.9616	183.6578	112.2880	60.4382	40.0679 (83)
Total gains	513.5379	570.1437	611.5633	670.8558	706.9168	698.4776	666.5512	622.6652	576.7363	522.8997	497.8430	495.2892 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	85.8055	86.0132	86.2178	87.1921	87.3768	88.2472	88.2472	88.4102	87.9099	87.3768	87.0039	86.6175
	6.7204	6.7342	6.7479	6.8128	6.8251	6.8831	6.8831	6.8940	6.8607	6.8251	6.8003	6.7745

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util living area	0.9980	0.9954	0.9876	0.9497	0.8334	0.6244	0.4562	0.5084	0.7803	0.9681	0.9950	0.9984 (86)
MIT	20.1206	20.2508	20.4488	20.7250	20.9198	20.9905	20.9990	20.9980	20.9611	20.7117	20.3737	20.1012 (87)
Th 2	20.0322	20.0343	20.0364	20.0461	20.0479	20.0564	20.0564	20.0580	20.0532	20.0479	20.0442	20.0404 (88)
util rest of house												
MIT 2	0.9971	0.9934	0.9821	0.9282	0.7760	0.5376	0.3591	0.4058	0.6954	0.9498	0.9924	0.9978 (89)
Living area fraction	19.2417	19.3728	19.5696	19.8393	20.0016	20.0531	20.0563	20.0576	20.0362	19.8339	19.5036	19.2292 (90)
MIT	19.5457	19.6765	19.8737	20.1456	20.3192	20.3773	20.3823	20.3829	20.3561	20.1374	19.8045	19.5308 (91)
Temperature adjustment												0.0000 (92)
adjusted MIT	19.5457	19.6765	19.8737	20.1456	20.3192	20.3773	20.3823	20.3829	20.3561	20.1374	19.8045	19.5308 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9966	0.9925	0.9810	0.9308	0.7936	0.5677	0.3928	0.4415	0.7243	0.9519	0.9916	0.9973	(94)
Useful gains	511.7709	565.8481	599.9259	624.4411	560.9991	396.5214	261.7928	274.8798	417.7536	497.7571	493.6498	493.9383	(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	1086.3267	1050.3485	948.3815	788.5602	603.1102	400.2694	262.0504	275.4356	435.1052	667.3660	892.7871	1082.1521	(97)
Space heating kWh	427.4695	325.5843	259.2510	118.1658	31.3306	0.0000	0.0000	0.0000	0.0000	126.1891	287.3788	437.6311	(98a)
Space heating requirement - total per year (kWh/year)												2013.0001	
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	427.4695	325.5843	259.2510	118.1658	31.3306	0.0000	0.0000	0.0000	0.0000	126.1891	287.3788	437.6311	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2013.0001	
Space heating per m2										(98c) / (4) =		29.9955	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												83.0000	(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	427.4695	325.5843	259.2510	118.1658	31.3306	0.0000	0.0000	0.0000	0.0000	126.1891	287.3788	437.6311	(98)
Space heating efficiency (main heating system 1)	83.0000	83.0000	83.0000	83.0000	83.0000	0.0000	0.0000	0.0000	0.0000	83.0000	83.0000	83.0000	(210)
Space heating fuel (main heating system)	515.0235	392.2702	312.3506	142.3684	37.7478	0.0000	0.0000	0.0000	0.0000	152.0350	346.2395	527.2664	(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	264.2624	233.7578	248.2287	217.7156	210.7452	189.5477	186.6924	194.2190	196.4999	219.5598	234.0473	261.2830	(64)
Efficiency of water heater (217)m	84.5034	84.1891	83.5723	82.2271	80.4171	79.4000	79.4000	79.4000	79.4000	82.3368	83.9201	79.4000	(216)
Fuel for water heating, kWh/month	312.7241	277.6578	297.0225	264.7737	262.0650	238.7251	235.1290	244.6083	247.4810	266.6606	278.8932	308.9349	(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	23.5464	18.8898	17.0082	12.4609	9.6252	7.8638	8.7804	11.4131	14.8245	19.4505	21.9693	24.2008	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2425.3013	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.4000	
Water heating fuel used												3234.6751	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												190.0328	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												5936.0093	(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	2425.3013	0.2100	509.3133	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3234.6751	0.2100	679.2818	(264)
Space and water heating			1188.5951	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	190.0328	0.1443	27.4276	(268)
Total CO2, kg/year			1227.9519	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			18.3000	(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	2425.3013	1.1300	2740.5905	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3234.6751	1.1300	3655.1829	(278)
Space and water heating			6395.7734	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	190.0328	1.5338	291.4786	(282)
Total Primary energy kWh/year			6817.3528	(286)
Dwelling Primary energy Rate (DPER)			101.5800	(287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	67.1100	(1b) x 2.5000	(2b) = 167.7750	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.1100			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	167.7750	(5)

2. Ventilation rate

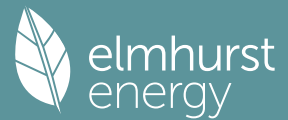
	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
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) =	0.1192 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3692	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3138 (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	0.4001	0.3923	0.3844	0.3452	0.3374	0.2981	0.2981	0.2903	0.3138	0.3374	0.3531	0.3687	(22b)
Effective ac	0.5801	0.5769	0.5739	0.5596	0.5569	0.5444	0.5444	0.5421	0.5492	0.5569	0.5623	0.5680	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			10.5600	1.1450	12.0916			(27)
Heatloss Floor			67.1100	0.1300	8.7243			(28a)
External Wall	67.1100	10.5600	56.5500	0.1800	10.1790			(29a)
Total net area of external elements Aum(A, m2)			134.2200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9949			(33)
Party Wall			42.4500	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							337.9772	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)				5.7500	0.0500		0.2875	
E3 Sill				4.8000	0.0500		0.2400	

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E4 Jamb	21.8000	0.0500	1.0900	
E5 Ground floor (normal)	16.9900	0.1600	2.7184	
E7 Party floor between dwellings (in blocks of flats)	16.9900	0.0700	1.1893	
E16 Corner (normal)	2.5000	0.0900	0.2250	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
P1 Party wall - Ground floor	16.9900	0.0800	1.3592	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.9900	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.4094 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		38.4043 (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	32.1150	31.9429	31.7742	30.9818	30.8336	30.1435	30.1435	30.0157	30.4093	30.8336	31.1335	31.4470
Average = Sum(39)m / 12 =	70.5193	70.3472	70.1785	69.3861	69.2379	68.5478	68.5478	68.4200	68.8136	69.2379	69.5378	69.8513
												69.3854
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0508	1.0482	1.0457	1.0339	1.0317	1.0214	1.0214	1.0195	1.0254	1.0317	1.0362	1.0408
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												1.0339
												1.0339

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1740 (42)
Hot water usage for mixer showers	60.6700	59.7582	58.4296	55.8876	54.0116	51.9196	50.7304	52.0490	53.4944	55.7406	58.3372	60.4375	(42a)
Hot water usage for baths	26.2133	25.8240	25.2758	24.2649	23.5081	22.6688	22.2154	22.7598	23.3526	24.2506	25.2823	26.1247	(42b)
Hot water usage for other uses	36.8936	35.5520	34.2105	32.8689	31.5273	30.1857	30.1857	31.5273	32.8689	34.2105	35.5520	36.8936	(42c)
Average daily hot water use (litres/day)													113.7792 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	123.7769	121.1343	117.9158	113.0214	109.0470	104.7740	103.1316	106.3361	109.7158	114.2017	119.1715	123.4558	(44)
Energy content (annual)	196.0324	172.4936	181.2323	154.7206	146.7982	128.8319	124.7287	131.6663	135.2906	154.9706	169.7817	193.3020	(45)
Distribution loss (46)m = 0.15 x (45)m	29.4049	25.8740	27.1848	23.2081	22.0197	19.3248	18.7093	19.7499	20.2936	23.2456	25.4673	28.9953	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	246.9913	218.5210	232.1912	204.0357	197.7571	178.1470	175.6876	182.6252	184.6056	205.9295	219.0968	244.2609	(62)
WWHRS	-27.7358	-24.5297	-25.6861	-21.2691	-19.8221	-16.9619	-15.8991	-16.9071	-17.5494	-20.6888	-23.4379	-27.2222	(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	219.2555	193.9912	206.5050	182.7666	177.9350	161.1851	159.7886	165.7182	167.0562	185.2407	195.6588	217.0387	(64)
12Total per year (kWh/year)													2232.1396 (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	77.9205	68.8610	72.9995	63.7734	61.5501	55.1654	54.2120	56.5188	57.3129	64.2674	68.7812	77.0126	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)

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

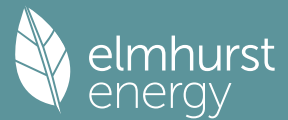
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.5565	111.3304	100.5565	103.9084	100.5565	103.9084	100.5565	100.5565	103.9084	100.5565	103.9084	100.5565	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.4603	192.4366	187.4562	176.8535	163.4695	150.8904	142.4868	140.5104	145.4908	156.0935	169.4775	182.0566	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	(71)
Water heating gains (Table 5)	104.7318	102.4717	98.1175	88.5741	82.7287	76.6186	72.8656	75.9661	79.6012	86.3810	95.5294	103.5116	(72)
Total internal gains	454.3581	464.8483	444.7398	427.9456	405.3642	387.0269	371.5184	372.6425	384.6100	401.6405	427.5249	444.7343	(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				3.5200	10.6334	0.6300	0.7000		0.7700		11.4390 (74)	
West				7.0400	19.6403	0.6300	0.7000		0.7700		42.2563 (80)	
Solar gains	53.6953	104.5228	173.2793	258.2084	323.6967	335.1270	317.4702	267.4313	202.9902	124.1078	66.8001	44.2856 (83)
Total gains	508.0534	569.3710	618.0191	686.1539	729.0609	722.1538	688.9886	640.0738	587.6002	525.7484	494.3250	489.0199 (84)

7. Mean internal temperature (heating season)

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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	89.3438	89.5623	89.7776	90.8029	90.9973	91.9134	91.9134	92.0851	91.5584	90.9973	90.6048	90.1981	
alpha	6.9563	6.9708	6.9852	7.0535	7.0665	7.1276	7.1276	7.1390	7.1039	7.0665	7.0403	7.0132	
util living area	0.9984	0.9959	0.9877	0.9452	0.8154	0.6005	0.4371	0.4901	0.7665	0.9683	0.9956	0.9987 (86)	
MIT	20.1501	20.2828	20.4835	20.7573	20.9372	20.9936	20.9994	20.9987	20.9690	20.7318	20.3974	20.1303 (87)	
Th 2	20.0412	20.0433	20.0454	20.0552	20.0570	20.0655	20.0655	20.0671	20.0622	20.0570	20.0533	20.0494 (88)	
util rest of house	0.9976	0.9941	0.9821	0.9219	0.7558	0.5165	0.3447	0.3917	0.6809	0.9496	0.9933	0.9982 (89)	
MIT 2	19.0601	19.2309	19.4861	19.8245	20.0120	20.0628	20.0654	20.0668	20.0456	19.8033	19.3855	19.0412 (90)	
Living area fraction									fLA = Living area / (4) =				0.3459 (91)
MIT	19.4371	19.5947	19.8310	20.1471	20.3320	20.3847	20.3884	20.3891	20.3649	20.1244	19.7354	19.4179 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.4371	19.5947	19.8310	20.1471	20.3320	20.3847	20.3884	20.3891	20.3649	20.1244	19.7354	19.4179 (93)	

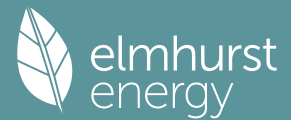
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9970	0.9929	0.9805	0.9245	0.7743	0.5456	0.3767	0.4259	0.7101	0.9513	0.9923	0.9977 (94)
Useful gains	506.5276	565.3339	605.9945	634.3512	564.5473	394.0161	259.5331	272.5768	417.2637	500.1343	490.5187	487.8779 (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	1067.4549	1033.7301	935.5523	780.3920	597.6589	396.5280	259.6875	272.9336	431.1122	659.4523	878.6399	1062.9879 (97)
Space heating kWh	417.3299	314.7622	245.1910	105.1494	24.6350	0.0000	0.0000	0.0000	0.0000	118.5326	279.4473	427.8818 (98a)
Space heating requirement - total per year (kWh/year)												1932.9292
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	417.3299	314.7622	245.1910	105.1494	24.6350	0.0000	0.0000	0.0000	0.0000	118.5326	279.4473	427.8818 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1932.9292
Space heating per m2										(98c) / (4) =		28.8024 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	417.3299	314.7622	245.1910	105.1494	24.6350	0.0000	0.0000	0.0000	0.0000	118.5326	279.4473	427.8818 (98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)	
Space heating fuel (main heating system)	451.6557	340.6518	265.3582	113.7980	26.6613	0.0000	0.0000	0.0000	0.0000	128.2820	302.4321	463.0756 (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	219.2555	193.9912	206.5050	182.7666	177.9350	161.1851	159.7886	165.7182	167.0562	185.2407	195.6588	217.0387 (64)	
Efficiency of water heater (217)m	85.7374	85.4120	84.7504	83.2409	81.2559	80.3000	80.3000	80.3000	80.3000	83.4500	85.1447	85.8073 (217)	
Fuel for water heating, kWh/month	255.7292	227.1241	243.6627	219.5635	218.9809	200.7286	198.9895	206.3738	208.0401	221.9780	229.7958	252.9374 (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	20.8937	16.7617	15.0920	11.0571	8.5408	6.9779	7.7912	10.1273	13.1543	17.2592	19.4942	21.4744 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.0223	-26.7218	-40.3726	-47.7910	-53.6459	-50.8531	-50.2417	-46.3870	-39.9493	-31.6103	-20.2778	-15.4325 (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	-6.5432	-14.0651	-28.5224	-43.6804	-58.5846	-59.1626	-58.4579	-49.1069	-35.4921	-20.3777	-8.8204	-5.1515 (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													2091.9147 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													2683.9036 (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)													168.6237 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-829.2700 (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)

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Energy used	0.0000 (237)
Total delivered energy for all uses	4201.1721 (238)

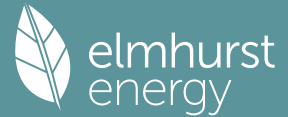
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2091.9147	0.2100	439.3021 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2683.9036	0.2100	563.6198 (264)
Space and water heating			1002.9218 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	168.6237	0.1443	24.3376 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-441.3053	0.1335	-58.9303
PV Unit electricity exported	-387.9647	0.1253	-48.6248
Total			-107.5551 (269)
Total CO2, kg/year			931.6336 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.8800 (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	2091.9147	1.1300	2363.8636 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2683.9036	1.1300	3032.8111 (278)
Space and water heating			5396.6747 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	168.6237	1.5338	258.6407 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-441.3053	1.4935	-659.0754
PV Unit electricity exported	-387.9647	0.4600	-178.4761
Total			-837.5515 (283)
Total Primary energy kWh/year			4947.8647 (286)
Target Primary Energy Rate (TPER)			73.7300 (287)

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Property Reference	Baseline			Issued on Date	06/01/2025
Assessment Reference	TF-Unit 19 (Block B)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	84 B	DER	15.67	TER	11.92
Environmental	88 B	% DER < TER			-31.46
CO ₂ Emissions (t/year)	0.94	DFEE	23.16	TFEE	23.99
Compliance Check	See BREL	% DFEE < TFEE			3.47
% DPER < TPER	-38.36	DPER	87.43	TPER	63.19
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.8700 (1b)	x 2.4000 (2b)	= 150.8880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 150.8880 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1325 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3825 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3252 (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	0.4146	0.4065	0.3983	0.3577	0.3496	0.3089	0.3089	0.3008	0.3252	0.3496	0.3658	0.3821 (22b)
Effective ac	0.5859	0.5826	0.5793	0.5640	0.5611	0.5477	0.5477	0.5452	0.5529	0.5611	0.5669	0.5730 (25)

3. Heat losses and heat loss parameter

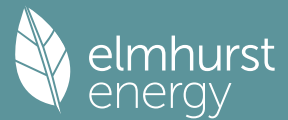
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.20)			11.4800	1.1450	13.1450		(27)
External Wall	23.8300	11.4800	12.3500	0.1800	2.2230	70.0000	864.5000 (29a)
External Roof	62.8700		62.8700	0.1000	6.2870	9.0000	565.8300 (30)
Total net area of external elements A _{um} (A, m ²)			86.7000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	21.6550			(33)
Party Wall			54.2200	0.0000	0.0000	180.0000	9759.6000 (32)
Party Floor			62.8700			40.0000	2514.8000 (32d)
Internal Wall			125.1400			9.0000	1126.2600 (32c)

Heat capacity C_m = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14830.9900 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 235.8993 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.1500	0.3000	1.8450
E3 Sill	5.2000	0.0400	0.2080
E4 Jamb	17.4000	0.0500	0.8700
E7 Party floor between dwellings (in blocks of flats)	9.9300	0.0700	0.6951
E18 Party wall between dwellings	4.8000	0.0600	0.2880
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	22.5900	0.0000	0.0000
E15 Flat roof with parapet	9.9300	0.2800	2.7804

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P4 Party wall - Roof (insulation at ceiling level) 22.5900 0.1200 2.7108
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.3973 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 31.0523 (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 29.1758 29.0096 28.8467 28.0817 27.9386 27.2722 27.2722 27.1489 27.5289 27.9386 28.2281 28.5309 (38)
 Average = Sum(39)m / 12 = 60.2281 60.0620 59.8991 59.1340 58.9909 58.3246 58.3246 58.2012 58.5812 58.9909 59.2805 59.5832 (39)
 59.1334

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 HLP (average) 0.9580 0.9553 0.9527 0.9406 0.9383 0.9277 0.9277 0.9257 0.9318 0.9383 0.9429 0.9477 (40)
 Days in mont 31 28 31 30 31 30 31 31 30 31 30 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0615 (42)
 Hot water usage for mixer showers 66.1324 65.1385 63.6903 60.9194 58.8745 56.5941 55.2979 56.7352 58.3107 60.7592 63.5896 65.8790 (42a)
 Hot water usage for baths 26.7394 26.3423 25.7830 24.7519 23.9798 23.1237 22.6613 23.2166 23.8212 24.7373 25.7897 26.6490 (42b)
 Hot water usage for other uses 37.6231 36.2550 34.8868 33.5187 32.1506 30.7825 30.7825 32.1506 33.5187 34.8868 36.2550 37.6231 (42c)
 Average daily hot water use (litres/day) 119.9662 (43)
 Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 Energy conte 130.4948 127.7357 124.3602 119.1901 115.0050 110.5004 108.7417 112.1024 115.6507 120.3833 125.6342 130.1510 (44)
 Energy content (annual) 206.6719 181.8940 191.1370 163.1652 154.8188 135.8731 131.5137 138.8062 142.6088 163.3590 178.9890 203.7851 (45)
 Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1992.6218
 31.0008 27.2841 28.6705 24.4748 23.2228 20.3810 19.7271 20.8209 21.3913 24.5039 26.8483 30.5678 (46)
 Water storage loss:
 Total storage loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)
 If cylinder contains dedicated solar storage 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)
 Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)
 Combi loss 50.9589 46.0274 50.9589 49.3151 50.9589 49.3151 50.9589 50.9589 49.3151 50.9589 49.3151 50.9589 (61)
 Total heat required for water heating calculated for each month
 WWHRs 257.6308 227.9214 242.0959 212.4803 205.7777 185.1882 182.4726 189.7651 191.9239 214.3179 228.3040 254.7440 (62)
 PV diverter 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)
 Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63b)
 FGHRs 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)
 Output from w/h 257.6308 227.9214 242.0959 212.4803 205.7777 185.1882 182.4726 189.7651 191.9239 214.3179 228.3040 254.7440 (64)
 Total per year (kWh/year) = Sum(64)m = 2592.6218 (64)
 2593 (64)
 12Total per year (kWh/year)
 Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
 Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
 Heat gains from water heating, kWh/month 81.4581 71.9866 76.2928 66.5812 64.2170 57.5066 56.4680 58.8928 59.7462 67.0566 71.8426 80.4983 (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 94.8097 104.9679 94.8097 97.9701 94.8097 97.9701 94.8097 94.8097 97.9701 94.8097 97.9701 94.8097 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 180.1228 181.9919 177.2818 167.2546 154.5970 142.7006 134.7531 132.8840 137.5941 147.6213 160.2789 172.1753 (68)
 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 (69)
 Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 0.0000 0.0000 0.0000 0.0000 3.0000 3.0000 3.0000 (70)
 Losses e.g. evaporation (negative values) (Table 5) -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 (71)
 Water heating gains (Table 5) 109.4867 107.1229 102.5440 92.4739 86.3132 79.8702 75.8979 79.1570 82.9808 90.1298 99.7814 108.1966 (72)
 Total internal gains 441.3419 451.0054 431.5582 414.6211 392.6425 374.4635 359.3834 360.7734 372.4676 389.4836 414.9530 432.1042 (73)

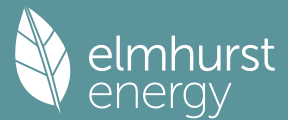
6. Solar gains

[Jan] Area Solar flux g Specific data FF Access Gains
 m2 Table 6a W/m2 or Table 6b Specific data or Table 6c factor Table 6d W
 South 11.4800 46.7521 0.5700 0.7000 0.7700 148.4051 (78)
 Solar gains 148.4051 243.0493 309.6017 349.9171 364.6353 350.9119 342.8622 332.9667 323.4155 262.1515 175.9106 128.2357 (83)
 Total gains 589.7470 694.0547 741.1599 764.5383 757.2778 725.3754 702.2456 693.7401 695.8832 651.6350 590.8637 560.3399 (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 68.4019 68.5912 68.7777 69.6675 69.8365 70.6344 70.6344 70.7841 70.3249 69.8365 69.4954 69.1423
 alpha 5.5601 5.5727 5.5852 5.6445 5.6558 5.7090 5.7090 5.7189 5.6883 5.6558 5.6330 5.6095
 util living area 0.9781 0.9499 0.9067 0.8200 0.6879 0.5089 0.3647 0.3849 0.5695 0.8230 0.9512 0.9826 (86)

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MIT	20.2053	20.4296	20.6355	20.8353	20.9486	20.9923	20.9990	20.9987	20.9853	20.8564	20.5132	20.1640 (87)
Th 2	20.1185	20.1207	20.1229	20.1331	20.1351	20.1440	20.1440	20.1457	20.1406	20.1351	20.1312	20.1271 (88)
util rest of house	0.9723	0.9380	0.8858	0.7840	0.6348	0.4433	0.2942	0.3140	0.5031	0.7809	0.9375	0.9780 (89)
MIT 2	19.4159	19.6330	19.8272	20.0125	20.1036	20.1407	20.1438	20.1453	20.1336	20.0353	19.7251	19.3828 (90)
Living area fraction									fLA = Living area / (4) =			0.4129 (91)
MIT	19.7419	19.9619	20.1609	20.3522	20.4525	20.4923	20.4969	20.4977	20.4853	20.3744	20.0505	19.7054 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7419	19.9619	20.1609	20.3522	20.4525	20.4923	20.4969	20.4977	20.4853	20.3744	20.0505	19.7054 (93)

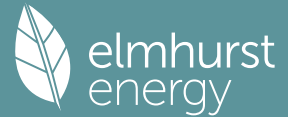
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9694	0.9355	0.8868	0.7936	0.6548	0.4703	0.3233	0.3433	0.5301	0.7933	0.9360	0.9753 (94)
Useful gains	571.6968	649.3171	657.2508	606.7168	495.8934	341.1088	227.0406	238.1406	368.9115	516.9272	553.0652	546.4887 (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	930.0345	904.6483	818.2783	677.2174	516.3192	343.6679	227.2861	238.4896	374.0559	576.5986	767.7132	923.8602 (97)
Space heating kWh	266.6032	171.5826	119.8044	50.7605	15.1968	0.0000	0.0000	0.0000	0.0000	44.3955	154.5465	280.7644 (98a)
Space heating requirement - total per year (kWh/year)												1103.6541
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	266.6032	171.5826	119.8044	50.7605	15.1968	0.0000	0.0000	0.0000	0.0000	44.3955	154.5465	280.7644 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1103.6541
Space heating per m2										(98c) / (4) =		17.5545 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												83.0000 (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	266.6032	171.5826	119.8044	50.7605	15.1968	0.0000	0.0000	0.0000	0.0000	44.3955	154.5465	280.7644 (98)
Space heating efficiency (main heating system 1)	83.0000	83.0000	83.0000	83.0000	83.0000	0.0000	0.0000	0.0000	0.0000	83.0000	83.0000	83.0000 (210)
Space heating fuel (main heating system)	321.2087	206.7260	144.3427	61.1572	18.3094	0.0000	0.0000	0.0000	0.0000	53.4886	186.2006	338.2704 (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	257.6308	227.9214	242.0959	212.4803	205.7777	185.1882	182.4726	189.7651	191.9239	214.3179	228.3040	254.7440 (64)
Efficiency of water heater (217)m	83.5526	82.8786	82.0546	80.9250	79.9372	79.4000	79.4000	79.4000	79.4000	80.7543	82.6610	79.4000 (216)
Fuel for water heating, kWh/month	308.3458	275.0062	295.0423	262.5645	257.4241	233.2344	229.8144	238.9989	241.7178	265.3952	276.1933	304.3972 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	21.1317	16.9526	15.2640	11.1830	8.6381	7.0574	7.8800	10.2427	13.3042	17.4559	19.7163	21.7190 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1329.7037 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.4000
Water heating fuel used												3188.1341 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												170.5449 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												4774.3826 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	1329.7037	0.2100	279.2378 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	3188.1341	0.2100	669.5082 (264)
Space and water heating			948.7459 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	170.5449	0.1443	24.6149 (268)
Total CO ₂ , kg/year			985.2901 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.6700 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	1329.7037	1.1300	1502.5652 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	3188.1341	1.1300	3602.5915 (278)
Space and water heating			5105.1567 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	170.5449	1.5338	261.5874 (282)
Total Primary energy kWh/year			5496.8449 (286)
Dwelling Primary energy Rate (DPER)			87.4300 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.8700 (1b)	x 2.4000 (2b)	= 150.8880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 150.8880 (5)

2. Ventilation rate

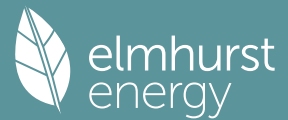
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1325 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3825 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3252 (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	0.4146	0.4065	0.3983	0.3577	0.3496	0.3089	0.3089	0.3008	0.3252	0.3496	0.3658	0.3821 (22b)
Effective ac	0.5859	0.5826	0.5793	0.5640	0.5611	0.5477	0.5477	0.5452	0.5529	0.5611	0.5669	0.5730 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (Uw = 1.20)			11.4800	1.1450	13.1450		(27)
External Wall	23.8300	11.4800	12.3500	0.1800	2.2230		(29a)
External Roof	62.8700		62.8700	0.1100	6.9157		(30)
Total net area of external elements Aum (A, m ²)			86.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.2837		(33)
Party Wall			54.2200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							235.8993 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E2 Other lintels (including other steel lintels)				6.1500	0.0500		0.3075
E3 Sill				5.2000	0.0500		0.2600
E4 Jamb				17.4000	0.0500		0.8700
E7 Party floor between dwellings (in blocks of flats)				9.9300	0.0700		0.6951

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E18 Party wall between dwellings	4.8000	0.0600	0.2880	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	22.5900	0.0000	0.0000	
E15 Flat roof with parapet	9.9300	0.5600	5.5608	
P4 Party wall - Roof (insulation at ceiling level)	22.5900	0.1200	2.7108	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				
Point Thermal bridges			(36a) =	10.6922 (36)
Total fabric heat loss			(33) + (36) + (36a) =	32.9759 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)				
(38)m	Jan	Feb	Mar	Apr
Heat transfer coeff	29.1758	29.0096	28.8467	28.0817
Average = Sum(39)m / 12 =	62.1517	61.9856	61.8227	61.0576
	May	Jun	Jul	Aug
	27.9386	27.2722	27.2722	27.1489
	60.9145	60.2482	60.2482	60.1248
	Sep	Oct	Nov	Dec
	27.5289	27.9386	28.2281	28.5309 (38)
	60.5048	60.9145	61.2041	61.5068 (39)
	61.0570			
HLP	Jan	Feb	Mar	Apr
HLP (average)	0.9886	0.9859	0.9833	0.9712
Days in mont	31	28	31	30
	May	Jun	Jul	Aug
	0.9689	0.9583	0.9583	0.9563
	31	30	31	31
	Sep	Oct	Nov	Dec
	0.9624	0.9689	0.9735	0.9783 (40)
	30	31	30	0.9712
				31

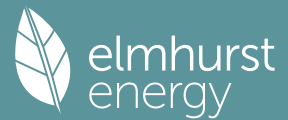
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.0615 (42)
Hot water usage for mixer showers												
58.7843	57.9009	56.6136	54.1506	52.3329	50.3059	49.1537	50.4313	51.8317	54.0081	56.5241	58.5591	(42a)
Hot water usage for baths												
25.4024	25.0251	24.4939	23.5143	22.7809	21.9675	21.5282	22.0558	22.6302	23.5005	24.5002	25.3165	(42b)
Hot water usage for other uses												
35.7419	34.4422	33.1425	31.8428	30.5431	29.2434	29.2434	30.5431	31.8428	33.1425	34.4422	35.7419	(42c)
Average daily hot water use (litres/day)												110.2419 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	119.9286	117.3683	114.2500	109.5077	105.6569	101.5168	99.9253	103.0302	106.3047	110.6511	115.4665	119.6175 (44)
Energy conte	189.9377	167.1308	175.5980	149.9106	142.2344	124.8268	120.8510	127.5729	131.0843	150.1525	164.5032	187.2922 (45)
Energy content (annual)										Total = Sum(45)m =		1831.0943
Distribution loss (46)m = 0.15 x (45)m												
28.4906	25.0696	26.3397	22.4866	21.3352	18.7240	18.1277	19.1359	19.6627	22.5229	24.6755	28.0938	(46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9209	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
240.8966	213.1582	226.5569	199.2256	193.1933	174.1418	171.7719	178.5318	180.3994	201.1114	213.8182	238.2511	(62)
WWHRS	-26.8737	-23.7674	-24.8878	-20.6081	-19.2060	-16.4347	-15.4049	-16.3816	-17.0040	-20.0458	-22.7095	-26.3761 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	214.0228	189.3909	201.6691	178.6176	173.9874	157.7071	156.3670	162.1502	163.3954	181.0656	191.1087	211.8750 (64)
12Total per year (kWh/year)												2181.3567 (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												
75.8940	67.0779	71.1261	62.1740	60.0327	53.8337	52.9132	55.1577	55.9143	62.6654	67.0261	75.0144	(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
103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
92.5834	102.5031	92.5834	95.6695	92.5834	95.6695	92.5834	92.5834	92.5834	95.6695	92.5834	95.6695	92.5834 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
180.1228	181.9919	177.2818	167.2546	154.5970	142.7006	134.7531	132.8840	137.5941	147.6213	160.2789	172.1753	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604 (71)
Water heating gains (Table 5)												
102.0081	99.8182	95.5995	86.3528	80.6891	74.7690	71.1199	74.1367	77.6588	84.2277	93.0918	100.8258	(72)
Total internal gains	431.6369	441.2358	422.3874	406.1995	384.7921	367.0617	352.3790	353.5267	364.8450	381.3551	405.9629	422.5071 (73)

6. Solar gains												
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
South	11.4800											
	46.7521											
	0.6300											
	0.7000											
	0.7700											
	164.0267											
Solar gains	164.0267	268.6334	342.1914	386.7505	403.0180	387.8500	378.9530	368.0159	357.4593	289.7464	194.4276	141.7342 (83)
Total gains	595.6636	709.8693	764.5787	792.9500	787.8101	754.9117	731.3320	721.5426	722.3043	671.1015	600.3904	564.2413 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	66.2849	66.4626	66.6377	67.4726	67.6312	68.3791	68.3791	68.5195	68.0891	67.6312	67.3112	66.9799

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alpha	5.4190	5.4308	5.4425	5.4982	5.5087	5.5586	5.5586	5.5680	5.5393	5.5087	5.4874	5.4653
util living area	0.9784	0.9489	0.9035	0.8147	0.6819	0.5047	0.3617	0.3822	0.5659	0.8210	0.9515	0.9830 (86)
MIT	20.1619	20.4024	20.6210	20.8285	20.9458	20.9916	20.9989	20.9985	20.9839	20.8474	20.4839	20.1169 (87)
Th 2	20.0929	20.0951	20.0972	20.1074	20.1093	20.1182	20.1182	20.1199	20.1148	20.1093	20.1055	20.1014 (88)
util rest of house	0.9726	0.9367	0.8819	0.7776	0.6276	0.4378	0.2896	0.3097	0.4982	0.7779	0.9377	0.9785 (89)
MIT 2	19.1426	19.4404	19.7038	19.9470	20.0671	20.1136	20.1179	20.1193	20.1051	19.9737	19.5533	19.0930 (90)
Living area fraction	19.5635	19.8376	20.0825	20.3110	20.4299	20.4761	20.4817	20.4824	20.4680	20.3345	19.9376	19.5158 (92)
MIT	19.5635	19.8376	20.0825	20.3110	20.4299	20.4761	20.4817	20.4824	20.4680	20.3345	19.9376	19.5158 (93)
Temperature adjustment												0.0000
adjusted MIT	19.5635	19.8376	20.0825	20.3110	20.4299	20.4761	20.4817	20.4824	20.4680	20.3345	19.9376	19.5158 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9685	0.9327	0.8815	0.7866	0.6477	0.4652	0.3194	0.3396	0.5256	0.7895	0.9347	0.9747 (94)
Ext temp.	576.9173	662.0898	673.9685	623.7132	510.2856	351.2116	233.5810	245.0503	379.6678	529.8643	561.1848	549.9795 (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	948.6530	925.9172	839.7073	696.7280	531.7801	354.0247	233.8625	245.4505	385.2921	592.9699	785.7114	942.0235 (97)
Space heating requirement - total per year (kWh/year)	276.5714	177.2920	123.3096	52.5706	15.9919	0.0000	0.0000	0.0000	0.0000	46.9506	161.6591	291.6807 (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)
Solar heating contribution - total per year (kWh/year)	276.5714	177.2920	123.3096	52.5706	15.9919	0.0000	0.0000	0.0000	0.0000	46.9506	161.6591	291.6807 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1146.0260
Space heating per m2												(98c) / (4) = 18.2285 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	276.5714	177.2920	123.3096	52.5706	15.9919	0.0000	0.0000	0.0000	0.0000	46.9506	161.6591	291.6807 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	299.3197	191.8745	133.4520	56.8946	17.3073	0.0000	0.0000	0.0000	0.0000	50.8123	174.9557	315.6718 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	214.0228	189.3909	201.6691	178.6176	173.9874	157.7071	156.3670	162.1502	163.3954	181.0656	191.1087	211.8750 (64)
Efficiency of water heater (217)m	84.9318	84.2402	83.3598	82.1061	80.9593	80.3000	80.3000	80.3000	80.3000	81.9320	84.0249	80.3000 (216)
Fuel for water heating, kWh/month	251.9937	224.8226	241.9260	217.5447	214.9073	196.3974	194.7285	201.9305	203.4812	220.9949	227.4430	85.0667 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	19.2370	15.4326	13.8954	10.1804	7.8636	6.4246	7.1734	9.3243	12.1113	15.8907	17.9486	19.7717 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-16.9147	-25.0975	-37.9488	-44.9632	-50.5133	-47.9039	-47.3303	-43.6781	-37.5856	-29.7070	-19.0384	-14.4822 (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)	-6.0989	-13.1124	-26.5934	-40.7291	-54.6265	-55.1610	-54.5016	-45.7824	-33.0895	-18.9964	-8.2214	-4.8013 (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												1240.2878 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2645.2390 (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)												155.2536 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-776.8768 (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												3349.9037 (238)

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

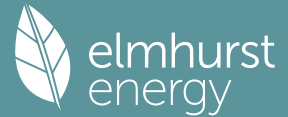
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1240.2878	0.2100	260.4604 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2645.2390	0.2100	555.5002 (264)
Space and water heating			815.9606 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	155.2536	0.1443	22.4079 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.1630	0.1335	-55.4314
PV Unit electricity exported	-361.7139	0.1253	-45.3345
Total			-100.7660 (269)
Total CO2, kg/year			749.5318 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9200 (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	1240.2878	1.1300	1401.5252 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2645.2390	1.1300	2989.1201 (278)
Space and water heating			4390.6453 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	155.2536	1.5338	238.1332 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.1630	1.4934	-620.0028
PV Unit electricity exported	-361.7139	0.4600	-166.3994
Total			-786.4022 (283)
Total Primary energy kWh/year			3972.4772 (286)
Target Primary Energy Rate (TPER)			63.1900 (287)

ii. Be Lean

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Property Reference	Be Lean			Issued on Date	06/01/2025
Assessment Reference	FF-Unit 5 (Block A)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	86 B	DER	12.28	TER	10.97
Environmental	91 B	% DER < TER			-11.94
CO ₂ Emissions (t/year)	0.7	DFEE	16.18	TFEE	19.03
Compliance Check	See BREL	% DFEE < TFEE			15.02
% DPER < TPER	-19.02	DPER	69.13	TPER	58.08
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	60.4500 (1b)	2.4000 (2b)	145.0800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.4500		145.0800 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	145.0800 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1379 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2879 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2447 (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	0.3120	0.3058	0.2997	0.2691	0.2630	0.2324	0.2324	0.2263	0.2447	0.2630	0.2753	0.2875 (22b)
Effective ac	0.5487	0.5468	0.5449	0.5362	0.5346	0.5270	0.5270	0.5256	0.5299	0.5346	0.5379	0.5413 (25)

3. Heat losses and heat loss parameter

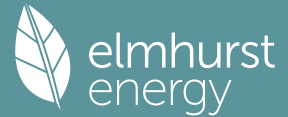
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.00)			11.1100	0.9615	10.6827		(27)
External Wall	38.1400	11.1100	27.0300	0.1300	3.5139	70.0000	1892.1000 (29a)
Total net area of external elements A _{um} (A, m ²)			38.1400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	14.1966		(33)
Party Wall			38.1400	0.0000	0.0000	180.0000	6865.2000 (32)
Party Floor			60.4500			40.0000	2418.0000 (32d)
Party Ceiling			60.4500			30.0000	1813.5000 (32b)
Internal Wall			98.7800			9.0000	889.0200 (32c)

Heat capacity C_m = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13877.8200 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 229.5752 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.0000	0.3000	1.8000
E3 Sill	3.2000	0.0400	0.1280
E4 Jamb	21.8000	0.0500	1.0900
E7 Party floor between dwellings (in blocks of flats)	27.7900	0.0700	1.9453
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	31.7800	0.0000	0.0000
E18 Party wall between dwellings	4.8000	0.0600	0.2880
E9 Balcony between dwellings, wall insulation continuous	3.0000	0.0200	0.0600

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E16 Corner (normal)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss

2.4000
0.0900
0.2160
5.5273 (36)
0.0000
(33) + (36) + (36a) = 19.7239 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m
Heat transfer coeff
Average = Sum(39)m / 12 =

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7608	0.7593	0.7579	0.7510	0.7497	0.7437	0.7437	0.7426	0.7460	0.7497	0.7523	0.7550 (40)
HLP (average)												0.7510
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Hot water usage for mixer showers
Hot water usage for baths
Hot water usage for other uses
Average daily hot water use (litres/day)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	127.9935	125.2874	121.9766	116.9055	112.8007	108.3824	106.6575	109.9537	113.4339	118.0758	123.2261	127.6563 (44)
Energy conte	202.7104	178.4076	187.4735	160.0378	151.8515	133.2689	128.9930	136.1456	139.8753	160.2278	175.5581	199.8789 (45)
Energy content (annual)										Total = Sum(45)m =	1954.4284	
Distribution loss (46)m = 0.15 x (45)m	30.4066	26.7611	28.1210	24.0057	22.7777	19.9903	19.3489	20.4218	20.9813	24.0342	26.3337	29.9818 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	28.3983	25.6409	28.3464	27.3140	28.1520	27.1657	28.0118	28.0478	27.1838	28.1757	27.3775	28.3816 (61)
Total heat required for water heating calculated for each month	231.1087	204.0485	215.8198	187.3519	180.0035	160.4345	157.0048	164.1935	167.0591	188.4035	202.9357	228.2605 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	231.1087	204.0485	215.8198	187.3519	180.0035	160.4345	157.0048	164.1935	167.0591	188.4035	202.9357	228.2605 (64)
12Total per year (kWh/year)												2286.6240 (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	74.5008	65.7307	69.4215	60.0411	57.5286	51.1033	49.8931	52.2804	53.3045	60.3197	65.2175	73.5551 (65)

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

Metabolic gains (Table 5), Watts
(66)m
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
Pumps, fans
Losses e.g. evaporation (negative values) (Table 5)
Water heating gains (Table 5)
Total internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164 (66)
Lighting gains	91.5122	101.3171	91.5122	94.5626	91.5122	94.5626	91.5122	91.5122	94.5626	91.5122	94.5626	91.5122 (67)
Appliances gains	174.0804	175.8868	171.3347	161.6438	149.4109	137.9136	130.2327	128.4263	132.9784	142.6693	154.9022	166.3995 (68)
Cooking gains	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716 (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)	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732 (71)
Water heating gains (Table 5)	100.1355	97.8136	93.3085	83.3904	77.3234	70.9768	67.0606	70.2693	74.0340	81.0748	90.5798	98.8644 (72)
Total internal gains	421.6430	430.9325	412.0704	395.5118	374.1614	356.3680	341.7205	343.1228	354.4900	371.1712	395.9596	412.6911 (73)

6. Solar gains

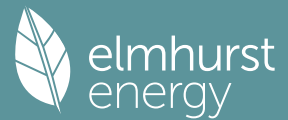
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
East	7.0400	19.6403	0.5700	0.7000	0.7700	38.2319 (76)						
South	4.0700	46.7521	0.5700	0.7000	0.7700	52.6140 (78)						
Solar gains	90.8459	160.9579	232.9310	303.6893	349.4213	349.7686	336.1067	302.3434	257.9099	181.6848	110.0362	76.9034 (83)
Total gains	512.4890	591.8904	645.0014	699.2011	723.5828	706.1366	677.8272	645.4662	612.3999	552.8560	505.9959	489.5945 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	83.8182	83.9834	84.1460	84.9180	85.0640	85.7504	85.7504	85.8787	85.4847	85.0640	84.7691	84.4631
alpha	6.5879	6.5989	6.6097	6.6612	6.6709	6.7167	6.7167	6.7252	6.6990	6.6709	6.6513	6.6309
util living area												

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	0.9757	0.9435	0.8810	0.7455	0.5757	0.4069	0.2918	0.3198	0.5054	0.7911	0.9445	0.9809 (86)
MIT	20.4502	20.6296	20.8029	20.9424	20.9900	20.9992	20.9999	20.9999	20.9966	20.9302	20.6831	20.4116 (87)
Th 2	20.2874	20.2887	20.2900	20.2960	20.2972	20.3024	20.3024	20.3034	20.3004	20.2972	20.2949	20.2925 (88)
util rest of house												
	0.9700	0.9317	0.8594	0.7112	0.5344	0.3628	0.2455	0.2714	0.4553	0.7523	0.9308	0.9763 (89)
MIT 2	19.7988	19.9709	20.1311	20.2547	20.2912	20.3020	20.3024	20.3033	20.2987	20.2488	20.0296	19.7657 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	20.0852	20.2604	20.4264	20.5570	20.5983	20.6084	20.6090	20.6095	20.6055	20.5483	20.3169	20.0496 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0852	20.2604	20.4264	20.5570	20.5983	20.6084	20.6090	20.6095	20.6055	20.5483	20.3169	20.0496 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9681	0.9312	0.8638	0.7242	0.5523	0.3821	0.2659	0.2927	0.4772	0.7667	0.9313	0.9744	(94)
Useful gains	496.1269	551.1711	557.1547	506.3688	399.6020	269.8499	180.2075	188.9222	292.2578	423.8609	471.2130	477.0687	(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	725.9872	705.0635	638.0036	529.1828	403.2564	270.1125	180.2256	188.9567	293.3658	450.8378	601.0482	723.3867	(97)
Space heating kWh	171.0161	103.4157	60.1516	16.4261	2.7189	0.0000	0.0000	0.0000	0.0000	20.0708	93.4813	183.2606	(98a)
Space heating requirement - total per year (kWh/year)												650.5411	
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	171.0161	103.4157	60.1516	16.4261	2.7189	0.0000	0.0000	0.0000	0.0000	20.0708	93.4813	183.2606	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												650.5411	
Space heating per m2										(98c) / (4) =			10.7616 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													83.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	171.0161	103.4157	60.1516	16.4261	2.7189	0.0000	0.0000	0.0000	0.0000	20.0708	93.4813	183.2606	(98)
Space heating efficiency (main heating system 1)	83.4000	83.4000	83.4000	83.4000	83.4000	0.0000	0.0000	0.0000	0.0000	83.4000	83.4000	83.4000	(210)
Space heating fuel (main heating system)	205.0553	123.9996	72.1243	19.6956	3.2600	0.0000	0.0000	0.0000	0.0000	24.0657	112.0879	219.7369	(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	231.1087	204.0485	215.8198	187.3519	180.0035	160.4345	157.0048	164.1935	167.0591	188.4035	202.9357	228.2605	(64)
Efficiency of water heater (217)m	88.2849	88.2672	88.2435	88.2161	88.2030	88.2000	88.2000	88.2000	88.2000	88.2192	88.2630	88.2890	(216)
Fuel for water heating, kWh/month	261.7759	231.1714	244.5730	212.3784	204.0787	181.8986	178.0099	186.1604	189.4094	213.5629	229.9216	258.5380	(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	19.2845	15.4707	13.9297	10.2055	7.8830	6.4405	7.1911	9.3473	12.1412	15.9299	17.9928	19.8204	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												780.0253	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												88.2000	
Water heating fuel used												2591.4783	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												155.6366	(232)

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

PV generation													0.0000 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													3613.1402 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	780.0253	0.2100	163.8053 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	2591.4783	0.2100	544.2104 (264)
Space and water heating			708.0158 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	155.6366	0.1443	22.4632 (268)
Total CO ₂ , kg/year			742.4082 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.2800 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	780.0253	1.1300	881.4286 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	2591.4783	1.1300	2928.3705 (278)
Space and water heating			3809.7991 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	155.6366	1.5338	238.7207 (282)
Total Primary energy kWh/year			4178.6205 (286)
Dwelling Primary energy Rate (DPER)			69.1300 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	60.4500 (1b)	x 2.4000 (2b)	= 145.0800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.4500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.0800 (5)

2. Ventilation rate

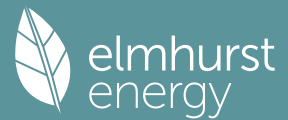
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1379 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3879 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3297 (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	0.4203	0.4121	0.4039	0.3626	0.3544	0.3132	0.3132	0.3050	0.3297	0.3544	0.3709	0.3874 (22b)
Effective ac	0.5883	0.5849	0.5815	0.5658	0.5628	0.5490	0.5490	0.5465	0.5543	0.5628	0.5688	0.5750 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (Uw = 1.20)			11.1100	1.1450	12.7214		(27)
External Wall	38.1400	11.1100	27.0300	0.1800	4.8654		(29a)
Total net area of external elements Aum(A, m ²)			38.1400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	17.5868	(33)
Party Wall			38.1400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							239.5752 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.0000	0.0500	0.3000	
E3 Sill				3.2000	0.0500	0.1600	
E4 Jamb				21.8000	0.0500	1.0900	
E7 Party floor between dwellings (in blocks of flats)				27.7900	0.0700	1.9453	

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P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	31.7800	0.0000	0.0000										
E18 Party wall between dwellings	4.8000	0.0600	0.2880										
E9 Balcony between dwellings, wall insulation continuous	3.0000	0.0200	0.0600										
E16 Corner (normal)	2.4000	0.0900	0.2160										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				4.0593 (36)									
Point Thermal bridges				0.0000									
Total fabric heat loss		(33) + (36) + (36a) =		21.6461 (37)									
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	28.1677	28.0035	27.8425	27.0863	26.9449	26.2863	26.2863	26.1643	26.5400	26.9449	27.2311	27.5303	(38)
Average = Sum(39)m / 12 =	49.8138	49.6495	49.4885	48.7324	48.5909	47.9324	47.9324	47.8104	48.1860	48.5909	48.8771	49.1763	(39)
												48.7317	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8240	0.8213	0.8187	0.8062	0.8038	0.7929	0.7929	0.7909	0.7971	0.8038	0.8086	0.8135	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												0.8061	
												31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.9943 (42)
Hot water usage for mixer showers													
57.6579	56.7914	55.5288	53.1130	51.3301	49.3419	48.2118	49.4649	50.8385	52.9733	55.4410	57.4370	(42a)	
Hot water usage for baths													
24.9180	24.5479	24.0268	23.0659	22.3464	21.5486	21.1177	21.6352	22.1987	23.0523	24.0330	24.8338	(42b)	
Hot water usage for other uses													
35.0539	33.7792	32.5045	31.2299	29.9552	28.6805	28.6805	29.9552	31.2299	32.5045	33.7792	35.0539	(42c)	
Average daily hot water use (litres/day)												108.1288	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
117.6298	115.1186	112.0601	107.4088	103.6317	99.5711	98.0100	101.0553	104.2671	108.5301	113.2532	117.3247	(44)	
Energy content (annual)	186.2969	163.9274	172.2323	147.0372	139.5082	122.4342	118.5347	125.1276	128.5717	147.2744	161.3500	183.7021	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1795.9966	
27.9445	24.5891	25.8348	22.0556	20.9262	18.3651	17.7802	18.7691	19.2858	22.0912	24.2025	27.5553	(46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.1035	49.9448	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
237.2558	209.9548	223.1912	196.3523	190.4672	171.5378	168.4795	176.0865	177.8868	198.2333	210.6650	234.6610	(62)	
WWHRS	-26.3588	-23.3119	-24.4109	-20.2132	-18.8380	-16.1198	-15.1097	-16.0677	-16.6782	-19.6617	-22.2743	-25.8707	(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	210.8970	186.6428	198.7803	176.1391	171.6292	155.4180	153.3698	160.0188	161.2086	178.5716	188.3907	208.7904	(64)
12Total per year (kWh/year)												2149.8562	(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	74.6835	66.0127	70.0070	61.2186	59.1262	52.9853	51.8990	54.3446	55.0789	61.7085	65.9776	73.8207	(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	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.3894	98.9668	89.3894	92.3690	89.3894	92.3690	89.3894	89.3894	92.3690	89.3894	92.3690	89.3894	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.0804	175.8868	171.3347	161.6438	149.4109	137.9136	130.2327	128.4263	132.9784	142.6693	154.9022	166.3995	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	(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)	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	(71)
Water heating gains (Table 5)	100.3810	98.2332	94.0954	85.0259	79.4707	73.5907	69.7567	73.0439	76.4984	82.9415	91.6356	99.2213	(72)
Total internal gains	419.7657	429.0017	410.7344	394.9537	374.1859	356.7882	342.2937	343.7745	354.7607	370.9150	394.8218	410.9252	(73)

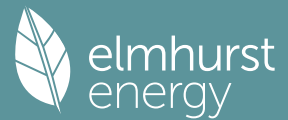
6. Solar gains

[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					7.0400	19.6403	0.6300		0.7000		0.7700	42.2563 (76)	
South					4.0700	46.7521	0.6300		0.7000		0.7700	58.1523 (78)	
Solar gains	100.4087	177.9009	257.4501	335.6565	386.2025	386.5863	371.4863	334.1691	285.0583	200.8095	121.6190	84.9985	(83)
Total gains	520.1743	606.9026	668.1845	730.6102	760.3884	743.3745	713.7800	677.9435	639.8191	571.7245	516.4408	495.9237	(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	

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tau	80.7581	81.0253	81.2888	82.5501	82.7905	83.9280	83.9280	84.1421	83.4861	82.7905	82.3057	81.8049
alpha	6.3839	6.4017	6.4193	6.5033	6.5194	6.5952	6.5952	6.6095	6.5657	6.5194	6.4870	6.4537
util living area	0.9807	0.9525	0.8940	0.7588	0.5860	0.4120	0.2954	0.3243	0.5162	0.8080	0.9536	0.9848 (86)
MIT	20.3714	20.5675	20.7649	20.9308	20.9877	20.9990	20.9999	20.9998	20.9957	20.9149	20.6336	20.3387 (87)
Th 2	20.2325	20.2349	20.2372	20.2480	20.2500	20.2595	20.2595	20.2612	20.2558	20.2500	20.2459	20.2416 (88)
util rest of house	0.9757	0.9416	0.8726	0.7226	0.5415	0.3646	0.2457	0.2723	0.4620	0.7679	0.9409	0.9808 (89)
MIT 2	19.5152	19.7585	19.9943	20.1849	20.2407	20.2589	20.2594	20.2612	20.2532	20.1748	19.8521	19.4818 (90)
Living area fraction									FLA = Living area / (4) =			0.4395 (91)
MIT	19.8915	20.1141	20.3330	20.5128	20.5690	20.5842	20.5849	20.5858	20.5796	20.5001	20.1956	19.8584 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8915	20.1141	20.3330	20.5128	20.5690	20.5842	20.5849	20.5858	20.5796	20.5001	20.1956	19.8584 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9730	0.9396	0.8755	0.7357	0.5606	0.3854	0.2676	0.2951	0.4857	0.7819	0.9400	0.9784 (94)
Useful gains	506.1545	570.2622	584.9729	537.5112	426.2812	286.5063	190.9823	200.0819	310.7805	447.0127	485.4344	485.2022 (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	776.6733	755.3716	684.5739	565.9174	430.9540	286.8363	191.0057	200.1263	312.2254	481.0544	640.0759	770.0247 (97)
Space heating kWh	201.2660	124.3935	74.1032	20.4525	3.4766	0.0000	0.0000	0.0000	0.0000	25.3270	111.3419	211.9079 (98a)
Space heating requirement - total per year (kWh/year)												772.2685
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	201.2660	124.3935	74.1032	20.4525	3.4766	0.0000	0.0000	0.0000	0.0000	25.3270	111.3419	211.9079 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												772.2685
Space heating per m2										(98c) / (4) =		12.7753 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	201.2660	124.3935	74.1032	20.4525	3.4766	0.0000	0.0000	0.0000	0.0000	25.3270	111.3419	211.9079 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	217.8203	134.6250	80.1982	22.1348	3.7625	0.0000	0.0000	0.0000	0.0000	27.4101	120.4999	229.3376 (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	210.8970	186.6428	198.7803	176.1391	171.6292	155.4180	153.3698	160.0188	161.2086	178.5716	188.3907	208.7904 (64)
Efficiency of water heater (217)m	84.2813	83.5317	82.4664	81.1164	80.4545	80.3000	80.3000	80.3000	80.3000	81.2766	83.2932	80.3000 (216)
Fuel for water heating, kWh/month	250.2298	223.4394	241.0440	217.1437	213.3245	193.5467	190.9960	199.2762	200.7579	219.7084	226.1779	247.3432 (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 (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	18.5733	14.9002	13.4160	9.8291	7.5923	6.2030	6.9260	9.0026	11.6935	15.3425	17.3293	19.0896 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	(233a)m	-16.2835	-24.1718	-36.5663	-43.3478	-48.7209	-46.2151	-45.6646	-42.1315	-36.2387	-28.6234	-18.3326 (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 (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 (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 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	(233b)m	-5.8442	-12.5674	-25.4916	-39.0460	-52.3718	-52.8826	-52.2476	-43.8856	-31.7159	-18.2053	-7.8779 (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 (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 (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 (235d)

Annual totals kWh/year												
Space heating fuel - main system 1												835.7885 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2622.9876 (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)												149.8975 (232)

Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-746.9732 (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												2947.7004 (238)

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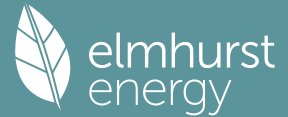
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	835.7885	0.2100	175.5156 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2622.9876	0.2100	550.8274 (264)
Space and water heating			726.3430 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	149.8975	0.1443	21.6348 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-400.2369	0.1335	-53.4340
PV Unit electricity exported	-346.7362	0.1253	-43.4567
Total			-96.8907 (269)
Total CO2, kg/year			663.0164 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9700 (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	835.7885	1.1300	944.4410 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2622.9876	1.1300	2963.9760 (278)
Space and water heating			3908.4170 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	149.8975	1.5338	229.9178 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-400.2369	1.4934	-597.6954
PV Unit electricity exported	-346.7362	0.4600	-159.5068
Total			-757.2022 (283)
Total Primary energy kWh/year			3511.2334 (286)
Target Primary Energy Rate (TPER)			58.0800 (287)

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Property Reference	Be Lean			Issued on Date	06/01/2025
Assessment Reference	FF-Unit 7 (Block A)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	86 B	DER	13.03	TER	11.77
Environmental	91 B	% DER < TER			-10.71
CO ₂ Emissions (t/year)	0.61	DFEE	15.13	TFEE	17.53
Compliance Check	See BREL	% DFEE < TFEE			13.72
% DPER < TPER	-17.29	DPER	73.41	TPER	62.59
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.1400 (1b)	2.4000 (2b)	117.9360 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	117.9360 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1696 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.3196 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2477 (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	0.3158	0.3096	0.3034	0.2724	0.2663	0.2353	0.2353	0.2291	0.2477	0.2663	0.2786	0.2910 (22b)
Effective ac	0.5499	0.5479	0.5460	0.5371	0.5354	0.5277	0.5277	0.5262	0.5307	0.5354	0.5388	0.5423 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.00)			8.8000	0.9615	8.4615		(27)
External Wall	20.6400	8.8000	11.8400	0.1300	1.5392	70.0000	828.8000 (29a)
Total net area of external elements A _{um} (A, m ²)			20.6400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		10.0007		(33)
Party Wall			48.7900	0.0000	0.0000	180.0000	8782.2000 (32)
Party Floor			49.1400			40.0000	1965.6000 (32d)
Party Ceiling			49.1400			30.0000	1474.2000 (32b)
Internal Wall			71.2300			9.0000	641.0700 (32c)

Heat capacity C_m = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13691.8700 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 278.6298 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.9500	0.3000	1.4850
E3 Sill	4.0000	0.0400	0.1600
E4 Jamb	17.4000	0.0500	0.8700
E7 Party floor between dwellings (in blocks of flats)	17.2000	0.0700	1.2040
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	40.6600	0.0000	0.0000
E18 Party wall between dwellings	4.8000	0.0600	0.2880
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.0070 (36)

elmhurst
energy

$$\begin{aligned} (33) + (36) + (36a) &= 0.0000 \\ (33) + (36) + (36a) &= 14.0077 \quad (37) \end{aligned}$$
[illegible]

4. Water heating energy requirements (kWh/year)

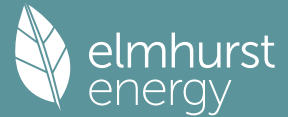
5. Internal gains (see Table 5 and 5a)

6. Solar gains

7. Mean internal temperature (heating season)

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Th 2	20.3227	20.3241	20.3254	20.3316	20.3328	20.3382	20.3382	20.3392	20.3361	20.3328	20.3304	20.3280 (88)
util rest of house	0.9788	0.9476	0.8705	0.6935	0.5022	0.3366	0.2295	0.2581	0.4456	0.7602	0.9438	0.9836 (89)
MIT 2	19.9688	20.0995	20.2307	20.3168	20.3317	20.3382	20.3382	20.3392	20.3358	20.3089	20.1496	19.9460 (90)
Living area fraction									FLA = Living area / (4) =			0.5275 (91)
MIT	20.3010	20.4345	20.5723	20.6655	20.6831	20.6872	20.6873	20.6877	20.6858	20.6540	20.4820	20.2753 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3010	20.4345	20.5723	20.6655	20.6831	20.6872	20.6873	20.6877	20.6858	20.6540	20.4820	20.2753 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9495	0.8790	0.7113	0.5223	0.3571	0.2509	0.2809	0.4704	0.7800	0.9470	0.9832	(94)
Useful gains	403.0248	441.6644	447.8725	402.3187	312.3276	210.2549	141.1920	147.8757	228.0379	336.6214	380.2894	389.1486	(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	566.5596	548.8701	496.1692	410.7512	313.0323	210.2801	141.1930	147.8783	228.2683	350.3480	468.0758	564.4892	(97)
Space heating kWh	121.6699	72.0422	35.9328	6.0714	0.5243	0.0000	0.0000	0.0000	0.0000	10.2127	63.2062	130.4534	(98a)
Space heating requirement - total per year (kWh/year)												440.1129	
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	121.6699	72.0422	35.9328	6.0714	0.5243	0.0000	0.0000	0.0000	0.0000	10.2127	63.2062	130.4534	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												440.1129	
Space heating per m2										(98c) / (4) =		8.9563	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												83.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	121.6699	72.0422	35.9328	6.0714	0.5243	0.0000	0.0000	0.0000	0.0000	10.2127	63.2062	130.4534 (98)
Space heating efficiency (main heating system 1)	83.4000	83.4000	83.4000	83.4000	83.4000	0.0000	0.0000	0.0000	0.0000	83.4000	83.4000	83.4000 (210)
Space heating fuel (main heating system)	145.8872	86.3816	43.0849	7.2799	0.6287	0.0000	0.0000	0.0000	0.0000	12.2454	75.7868	156.4189 (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	211.6522	186.9206	197.8163	171.9757	165.4083	147.5863	144.5418	151.0928	153.6150	173.0099	186.0776	209.0750 (64)
Efficiency of water heater	88.2729	88.2555	88.2307	88.2068	88.2006	88.2000	88.2000	88.2000	88.2000	88.2111	88.2506	88.2000 (216)
Fuel for water heating, kWh/month	239.7703	211.7948	224.2036	194.9687	187.5364	167.3314	163.8796	171.3070	174.1667	196.1317	210.8513	236.8404 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	15.5947	12.5107	11.2645	8.2528	6.3747	5.2082	5.8152	7.5589	9.8182	12.8820	14.5502	16.0281 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												527.7134 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												88.2000
Water heating fuel used												2378.7819 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												125.8583 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												3118.3535 (238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	527.7134	0.2100	110.8198 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2378.7819	0.2100	499.5442 (264)
Space and water heating			610.3640 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	125.8583	0.1443	18.1652 (268)
Total CO2, kg/year			640.4585 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.0300 (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	527.7134	1.1300	596.3161 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2378.7819	1.1300	2688.0235 (278)
Space and water heating			3284.3396 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	125.8583	1.5338	193.0457 (282)
Total Primary energy kWh/year			3607.4861 (286)
Dwelling Primary energy Rate (DPER)			73.4100 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	49.1400 (1b)	x 2.4000 (2b)	= 117.9360 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 117.9360 (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) = 0.1696 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4196 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3252 (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	0.4146	0.4065	0.3983	0.3577	0.3496	0.3089	0.3089	0.3008	0.3252	0.3496	0.3658	0.3821 (22b)
Effective ac	0.5859	0.5826	0.5793	0.5640	0.5611	0.5477	0.5477	0.5452	0.5529	0.5611	0.5669	0.5730 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			8.8000	1.1450	10.0763		(27)
External Wall	20.6400	8.8000	11.8400	0.1800	2.1312		(29a)
Total net area of external elements Aum(A, m2)			20.6400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		12.2075		(33)
Party Wall			48.7900	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							288.6298 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				4.9500	0.0500	0.2475	
E3 Sill				4.0000	0.0500	0.2000	
E4 Jamb				17.4000	0.0500	0.8700	
E7 Party floor between dwellings (in blocks of flats)				17.2000	0.0700	1.2040	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				40.6600	0.0000	0.0000	
E18 Party wall between dwellings				4.8000	0.0600	0.2880	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.8095 (36)

$$\begin{aligned} (33) + (36) + (36a) &= 15.0170 \quad (37) \end{aligned}$$
[illegible]

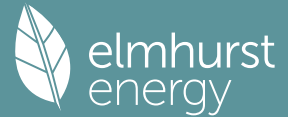
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.6648 (42)
Hot water usage for mixer showers	52.1329	51.3494	50.2078	48.0235	46.4115	44.6138	43.5920	44.7250	45.9670	47.8971	50.1284	51.9332 (42a)
Hot water usage for baths	22.5421	22.2073	21.7359	20.8666	20.2157	19.4940	19.1041	19.5723	20.0820	20.8543	21.7414	22.4659 (42b)
Hot water usage for other uses	31.6793	30.5274	29.3754	28.2234	27.0714	25.9195	25.9195	27.0714	28.2234	29.3754	30.5274	31.6793 (42c)
Average daily hot water use (litres/day)												97.7642 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	106.3543	104.0841	101.3190	97.1135	93.6986	90.0272	88.6156	91.3687	94.2724	98.1268	102.3972	106.0784 (44)
Energy content (annual)	168.4392	148.2144	155.7236	132.9435	126.1363	110.6990	107.1729	113.1336	116.2473	133.1572	145.8836	166.0931 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m =											1623.8435
Water storage loss:	25.2659	22.2322	23.3585	19.9415	18.9205	16.6048	16.0759	16.9700	17.4371	19.9736	21.8825	24.9140 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	47.8916	47.7478	44.3970	45.1575	46.5605	46.4905	50.0043	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	219.3981	194.2418	206.6825	180.8350	173.8841	155.0960	152.3304	159.6940	162.7378	183.1615	195.1987	217.0520 (62)
WWHRS	-23.8930	-21.0781	-22.0718	-18.2763	-17.0328	-14.5751	-13.6619	-14.5280	-15.0800	-17.7776	-20.1399	-23.3916 (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	195.5652	173.1637	184.6107	162.5588	156.8513	140.5208	138.6685	145.1660	147.6578	165.3839	175.0587	193.6603 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											1978.8658 (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	68.7458	60.7881	64.5178	56.1766	53.8773	47.9067	46.9244	49.2570	50.2749	56.7758	60.8351	67.9657 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.7595	82.7695	74.7595	77.2515	74.7595	77.2515	74.7595	74.7595	77.2515	74.7595	77.2515	74.7595 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	145.0005	146.5051	142.7135	134.6415	124.4520	114.8753	108.4775	106.9728	110.7645	118.8365	129.0260	138.6027 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241 (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)	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925 (71)
Water heating gains (Table 5)	92.4002	90.4585	86.7175	78.0230	72.4157	66.5370	63.0704	66.2057	69.8262	76.3116	84.4931	91.3517 (72)
Total internal gains	363.1324	370.7053	355.1627	340.8882	322.5994	306.6360	294.2796	295.9102	305.8144	320.8798	341.7428	355.6861 (73)

[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		
West					8.8000	19.6403	0.6300	0.7000	0.7700	52.8204 (80)		
Solar gains	52.8204	103.3279	170.1664	248.1775	304.1509	311.3526	296.4203	254.6207	197.9106	122.6073	65.8608	43.4369 (83)
Total gains	415.9528	474.0332	525.3291	589.0657	626.7503	617.9886	590.6999	550.5309	503.7249	443.4871	407.6037	399.1230 (84)

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	104.1684	104.5273	104.8816	106.5783	106.9018	108.4343	108.4343	108.7229	107.8388	106.9018	106.2493	105.5756
alpha	7.9446	7.9685	7.9921	8.1052	8.1268	8.2290	8.2290	8.2482	8.1893	8.1268	8.0833	8.0384
util living area	0.9873	0.9657	0.9042	0.7380	0.5450	0.3762	0.2706	0.3028	0.4996	0.8155	0.9644	0.9902 (86)
MIT	20.5422	20.6910	20.8555	20.9739	20.9976	20.9999	21.0000	21.0000	20.9991	20.9551	20.7459	20.5190 (87)

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Th 2	20.2797	20.2820	20.2843	20.2949	20.2969	20.3062	20.3062	20.3079	20.3026	20.2969	20.2929	20.2887 (88)
util rest of house	0.9834	0.9561	0.8823	0.7010	0.5045	0.3355	0.2280	0.2572	0.4495	0.7744	0.9529	0.9871 (89)
MIT 2	19.7604	19.9454	20.1397	20.2727	20.2952	20.3061	20.3062	20.3079	20.3021	20.2597	20.0241	19.7389 (90)
Living area fraction									FLA = Living area / (4) =			0.5275 (91)
MIT	20.1728	20.3387	20.5173	20.6426	20.6657	20.6721	20.6721	20.6730	20.6698	20.6265	20.4048	20.1504 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1728	20.3387	20.5173	20.6426	20.6657	20.6721	20.6721	20.6730	20.6698	20.6265	20.4048	20.1504 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9827	0.9570	0.8898	0.7195	0.5258	0.3569	0.2505	0.2812	0.4759	0.7943	0.9549	0.9864	(94)
Useful gains	408.7576	453.6386	467.4474	423.8261	329.5635	220.5901	147.9540	154.8360	239.7296	352.2671	389.2213	393.6839	(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	600.3320	581.9087	526.5478	434.0778	330.4257	220.6197	147.9552	154.8391	240.0201	369.5195	493.3524	595.2261	(97)
Space heating kWh	142.5313	86.1975	43.9707	7.3812	0.6415	0.0000	0.0000	0.0000	0.0000	12.8358	74.9744	149.9474	(98a)
Space heating requirement - total per year (kWh/year)												518.4798	
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	142.5313	86.1975	43.9707	7.3812	0.6415	0.0000	0.0000	0.0000	0.0000	12.8358	74.9744	149.9474	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												518.4798	
Space heating per m2										(98c) / (4) =		10.5511	(99)

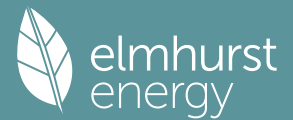
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	142.5313	86.1975	43.9707	7.3812	0.6415	0.0000	0.0000	0.0000	0.0000	12.8358	74.9744	149.9474	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	154.2547	93.2873	47.5873	7.9884	0.6942	0.0000	0.0000	0.0000	0.0000	13.8916	81.1411	162.2808	(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	195.5652	173.1637	184.6107	162.5588	156.8513	140.5208	138.6685	145.1660	147.6578	165.3839	175.0587	193.6603	(64)
Efficiency of water heater (217)m	83.7140	82.9674	81.8226	80.6388	80.3317	80.3000	80.3000	80.3000	80.3000	80.8634	82.6989	83.8393	(216)
Fuel for water heating, kWh/month	233.6110	208.7128	225.6231	201.5887	195.2546	174.9948	172.6881	180.7796	183.8827	204.5225	211.6821	230.9899	(217)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(219)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(221)
Lighting	15.5336	12.4616	11.2203	8.2205	6.3497	5.1878	5.7924	7.5292	9.7797	12.8315	14.4932	15.9653	(222)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-13.3209	-19.8196	-30.0548	-35.7251	-40.2493	-38.2278	-37.7861	-34.8233	-29.8851	-23.5233	-15.0173	-11.4003	(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	-4.6668	-10.0458	-20.3922	-31.2531	-41.9293	-42.3290	-41.8070	-35.1003	-25.3555	-14.5439	-6.2892	-3.6719	(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													561.1253 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													2424.3300 (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)													125.3647 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-607.2169 (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													2589.6031 (238)

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

Energy	Emission factor	Emissions
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	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	561.1253	0.2100	117.8363 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2424.3300	0.2100	509.1093 (264)
Space and water heating			626.9456 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	125.3647	0.1443	18.0940 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-329.8329	0.1334	-44.0152
PV Unit electricity exported	-277.3840	0.1253	-34.7625
Total			-78.7777 (269)
Total CO2, kg/year			578.1911 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7700 (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	561.1253	1.1300	634.0716 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2424.3300	1.1300	2739.4929 (278)
Space and water heating			3373.5645 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	125.3647	1.5338	192.2885 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-329.8329	1.4931	-492.4843
PV Unit electricity exported	-277.3840	0.4600	-127.5950
Total			-620.0793 (283)
Total Primary energy kWh/year			3075.8745 (286)
Target Primary Energy Rate (TPER)			62.5900 (287)

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Property Reference	Be Lean			Issued on Date	06/01/2025
Assessment Reference	FF-Unit 11 (Block B)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	86 B	DER	13.07	TER	11.72
Environmental	90 B	% DER < TER			-11.52
CO ₂ Emissions (t/year)	0.77	DFEE	19.58	TFEE	23.01
Compliance Check	See BREL	% DFEE < TFEE			14.92
% DPER < TPER	-18.11	DPER	73.34	TPER	62.09
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.9000 (1b)	2.4000 (2b)	150.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.9000		150.9600 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	150.9600 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1325 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2825 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2401 (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	0.3061	0.3001	0.2941	0.2641	0.2581	0.2281	0.2281	0.2221	0.2401	0.2581	0.2701	0.2821 (22b)
Effective ac	0.5469	0.5450	0.5433	0.5349	0.5333	0.5260	0.5260	0.5247	0.5288	0.5333	0.5365	0.5398 (25)

3. Heat losses and heat loss parameter

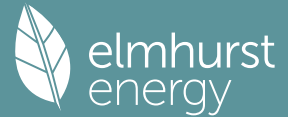
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.00)			11.4800	0.9615	11.0385		(27)
External Wall	39.0200	11.4800	27.5400	0.1300	3.5802	70.0000	1927.8000 (29a)
Total net area of external elements Aum(A, m ²)			39.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	14.6187		(33)
Party Wall			39.0200	0.0000	0.0000	180.0000	7023.6000 (32)
Party Floor			62.9000			40.0000	2516.0000 (32d)
Party Ceiling			62.9000			30.0000	1887.0000 (32b)
Internal Wall			104.0600			9.0000	936.5400 (32c)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 14290.9400 (34)
227.2010 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.1500	0.3000	1.8450
E3 Sill	5.2000	0.0400	0.2080
E4 Jamb	17.4000	0.0500	0.8700
E7 Party floor between dwellings (in blocks of flats)	32.5200	0.0700	2.2764
E16 Corner (normal)	2.4000	0.0900	0.2160
E18 Party wall between dwellings	4.8000	0.0600	0.2880
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.5200	0.0000	0.0000

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Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss

(33) + (36) + (36a) =
5.7034 (36)
0.0000
20.3221 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.2429	27.1523	27.0634	26.6460	26.5680	26.2045	26.2045	26.1371	26.3445	26.5680	26.7259	26.8911	(38)
Heat transfer coeff	47.5650	47.4743	47.3855	46.9681	46.8900	46.5265	46.5265	46.4592	46.6665	46.8900	47.0480	47.2131	(39)
Average = Sum(39)m / 12 =												46.9677	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7562	0.7548	0.7533	0.7467	0.7455	0.7397	0.7397	0.7386	0.7419	0.7455	0.7480	0.7506	(40)
HLP (average)												0.7467	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0623	(42)
Hot water usage for mixer showers													
66.1478	65.1538	63.7052	60.9336	58.8883	56.6074	55.3109	56.7485	58.3243	60.7734	63.6045	65.8944	(42a)	
Hot water usage for baths													
26.7456	26.3484	25.7890	24.7577	23.9854	23.1291	22.6666	23.2220	23.8268	24.7431	25.7957	26.6552	(42b)	
Hot water usage for other uses													
37.6319	36.2635	34.8950	33.5266	32.1582	30.7897	30.7897	32.1582	33.5266	34.8950	36.2635	37.6319	(42c)	
Average daily hot water use (litres/day)												119.9943	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.5254	127.7656	124.3893	119.2180	115.0319	110.5262	108.7672	112.1287	115.6777	120.4115	125.6636	130.1815	(44)
Energy conte	206.7203	181.9366	191.1817	163.2034	154.8551	135.9049	131.5445	138.8387	142.6422	163.3973	179.0309	203.8328	(45)
Energy content (annual)										Total = Sum(45)m =	1993.0882		
Distribution loss (46)m = 0.15 x (45)m	31.0080	27.2905	28.6773	24.4805	23.2283	20.3857	19.7317	20.8258	21.3963	24.5096	26.8546	30.5749	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	28.4007	25.6439	28.3508	27.3194	28.1584	27.1724	28.0188	28.0543	27.1895	28.1807	27.3812	28.3840	(61)
Total heat required for water heating calculated for each month	235.1209	207.5805	219.5325	190.5229	183.0135	163.0773	159.5633	166.8930	169.8317	191.5780	206.4121	232.2168	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	235.1209	207.5805	219.5325	190.5229	183.0135	163.0773	159.5633	166.8930	169.8317	191.5780	206.4121	232.2168	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2325.3424	(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	75.8347	66.9049	70.6556	61.0950	58.5289	51.9815	50.7432	53.1774	54.2259	61.3748	66.3731	74.8704	(65)

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

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.8578	105.0211	94.8578	98.0197	94.8578	98.0197	94.8578	94.8578	98.0197	94.8578	98.0197	94.8578	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.1971	182.0670	177.3549	167.3236	154.6607	142.7595	134.8087	132.9388	137.6509	147.6822	160.3451	172.2463	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	(71)
Water heating gains (Table 5)	101.9283	99.5609	94.9672	84.8542	78.6679	72.1965	68.2033	71.4751	75.3138	82.4930	92.1848	100.6323	(72)
Total internal gains	433.9181	443.5839	424.1149	407.1324	385.1214	366.9106	351.8047	353.2066	364.9193	381.9680	407.4845	424.6713	(73)

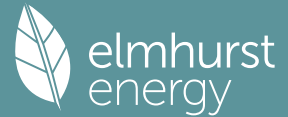
6. Solar gains

[Jan]													
				Area m2	Solar flux Table 6a		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W	
North				11.4800	10.6334		0.5700		0.7000		0.7700	33.7536 (74)	
Solar gains	33.7536	64.5048	109.6095	176.0609	237.1701	253.8977	237.0459	188.0657	131.7861	76.7846	41.6394	28.1387	(83)
Total gains	467.6717	508.0887	533.7243	583.1933	622.2915	620.8083	588.8506	541.2723	496.7054	458.7525	449.1239	452.8100	(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)													
tau	83.4586	83.6180	83.7748	84.5192	84.6599	85.3214	85.3214	85.4450	85.0654	84.6599	84.3757	84.0805	
alpha	6.5639	6.5745	6.5850	6.6346	6.6440	6.6881	6.6881	6.6963	6.6710	6.6440	6.6250	6.6054	
util living area	0.9871	0.9760	0.9504	0.8575	0.6796	0.4778	0.3475	0.3944	0.6351	0.8942	0.9724	0.9893	(86)

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MIT	20.3377	20.4655	20.6418	20.8639	20.9737	20.9977	20.9998	20.9995	20.9870	20.8455	20.5669	20.3120 (87)
Th 2	20.2915	20.2927	20.2939	20.2998	20.3008	20.3059	20.3059	20.3068	20.3040	20.3008	20.2986	20.2963 (88)
util rest of house												
	0.9838	0.9702	0.9385	0.8291	0.6348	0.4268	0.2928	0.3352	0.5761	0.8655	0.9647	0.9865 (89)
MIT 2	19.6932	19.8192	19.9897	20.1962	20.2844	20.3049	20.3058	20.3067	20.2973	20.1854	19.9243	19.6721 (90)
Living area fraction									fLA =	Living area / (4) =		0.4119 (91)
MIT	19.9587	20.0854	20.2583	20.4713	20.5683	20.5903	20.5917	20.5921	20.5814	20.4573	20.1890	19.9357 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9587	20.0854	20.2583	20.4713	20.5683	20.5903	20.5917	20.5921	20.5814	20.4573	20.1890	19.9357 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9819	0.9682	0.9378	0.8364	0.6523	0.4478	0.3153	0.3596	0.6000	0.8724	0.9632	0.9848	(94)
Useful gains	459.2177	491.9105	500.5284	487.8069	405.9060	277.9802	185.6627	194.6272	298.0418	400.2241	432.6173	445.9337	(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													
	744.8054	720.9173	651.9449	543.4806	415.8369	278.7064	185.7193	194.7600	302.4634	462.2100	615.8114	742.9301	(97)
Space heating kWh													
	212.4772	153.8925	112.6538	40.0850	7.3886	0.0000	0.0000	0.0000	0.0000	46.1175	131.8997	220.9654	(98a)
Space heating requirement - total per year (kWh/year)												925.4798	
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													
	212.4772	153.8925	112.6538	40.0850	7.3886	0.0000	0.0000	0.0000	0.0000	46.1175	131.8997	220.9654	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												925.4798	
Space heating per m2										(98c) / (4) =		14.7135	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													83.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	212.4772	153.8925	112.6538	40.0850	7.3886	0.0000	0.0000	0.0000	0.0000	46.1175	131.8997	220.9654	(98)
Space heating efficiency (main heating system 1)													
	83.4000	83.4000	83.4000	83.4000	83.4000	0.0000	0.0000	0.0000	0.0000	83.4000	83.4000	83.4000	(210)
Space heating fuel (main heating system)													
	254.7689	184.5234	135.0765	48.0636	8.8592	0.0000	0.0000	0.0000	0.0000	55.2968	158.1532	264.9465	(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													
	235.1209	207.5805	219.5325	190.5229	183.0135	163.0773	159.5633	166.8930	169.8317	191.5780	206.4121	232.2168	(64)
Efficiency of water heater													
(217)m	88.2948		88.2677	88.2347	88.2077	88.2000	88.2000	88.2000	88.2000	88.2387	88.2779	88.2974	(216)
Fuel for water heating, kWh/month													
	266.2907	235.1254	248.7121	215.9274	207.4801	184.8949	180.9107	189.2211	192.5529	217.1133	233.8209	262.9939	(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	20.2968	16.2829	14.6609	10.7412	8.2968	6.7786	7.5686	9.8380	12.7786	16.7662	18.9374	20.8610	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1109.6880	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												88.2000	
Water heating fuel used												2635.0433	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												163.8072	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3994.5384	(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	1109.6880	0.2100	233.0345 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2635.0433	0.2100	553.3591 (264)
Space and water heating			786.3936 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	163.8072	0.1443	23.6424 (268)
Total CO2, kg/year			821.9653 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.0700 (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	1109.6880	1.1300	1253.9474 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2635.0433	1.1300	2977.5989 (278)
Space and water heating			4231.5463 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	163.8072	1.5338	251.2529 (282)
Total Primary energy kWh/year			4612.9000 (286)
Dwelling Primary energy Rate (DPER)			73.3400 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	62.9000 (1b)	x 2.4000 (2b)	= 150.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 150.9600 (5)

2. Ventilation rate

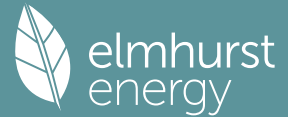
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1325 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3825 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3251 (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	0.4145	0.4064	0.3983	0.3576	0.3495	0.3089	0.3089	0.3007	0.3251	0.3495	0.3658	0.3820 (22b)
Effective ac	0.5859	0.5826	0.5793	0.5639	0.5611	0.5477	0.5477	0.5452	0.5528	0.5611	0.5669	0.5730 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			11.4800	1.1450	13.1450		(27)
External Wall	39.0200	11.4800	27.5400	0.1800	4.9572		(29a)
Total net area of external elements Aum(A, m2)			39.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.1022		(33)
Party Wall			39.0200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							237.2010 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.1500	0.0500	0.3075	
E3 Sill				5.2000	0.0500	0.2600	
E4 Jamb				17.4000	0.0500	0.8700	
E7 Party floor between dwellings (in blocks of flats)				32.5200	0.0700	2.2764	
E16 Corner (normal)				2.4000	0.0900	0.2160	
E18 Party wall between dwellings				4.8000	0.0600	0.2880	

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P3 Party wall - Intermediate floor between dwellings (in blocks of flats) 32.5200 0.0000 0.0000
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.2179 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 22.3201 (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 29.1883 29.0221 28.8592 28.0941 27.9509 27.2845 27.2845 27.1611 27.5412 27.9509 28.2405 28.5433 (38)
 Average = Sum(39)m / 12 = 51.5084 51.3422 51.1793 50.4142 50.2710 49.6046 49.6046 49.4812 49.8613 50.2710 50.5606 50.8634 (39)
 51.5084 51.3422 51.1793 50.4142 50.2710 49.6046 49.6046 49.4812 49.8613 50.2710 50.5606 50.8634 (39)
 50.4135

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 HLP (average) 0.8189 0.8163 0.8137 0.8015 0.7992 0.7886 0.7886 0.7867 0.7927 0.7992 0.8038 0.8086 (40)
 Days in mont 31 28 31 30 31 30 31 31 30 31 30 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0623 (42)
 Hot water usage for mixer showers 58.7981 57.9145 56.6268 54.1632 52.3452 50.3177 49.1652 50.4431 51.8439 54.0208 56.5373 58.5728 (42a)
 Hot water usage for baths 25.4083 25.0310 24.4996 23.5198 22.7862 21.9727 21.5332 22.0609 22.6355 23.5059 24.5059 25.3224 (42b)
 Hot water usage for other uses 35.7503 34.4503 33.1503 31.8503 30.5503 29.2503 29.2503 30.5503 31.8503 33.1503 34.4503 35.7503 (42c)
 Average daily hot water use (litres/day) 110.2677 (43)
 Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 Energy conte 119.9567 117.3957 114.2767 109.5333 105.6816 101.5406 99.9487 103.0543 106.3296 110.6770 115.4935 119.6455 (44)
 Energy content (annual) 189.9821 167.1700 175.6391 149.9457 142.2677 124.8560 120.8793 127.6027 131.1150 150.1877 164.5417 187.3360 (45)
 Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1831.5229
 28.4973 25.0755 26.3459 22.4918 21.3402 18.7284 18.1319 19.1404 19.6673 22.5281 24.6812 28.1004 (46)
 Water storage loss:
 Total storage loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)
 If cylinder contains dedicated solar storage 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)
 Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)
 Combi loss 50.9589 46.0274 50.9589 49.3151 50.9589 49.3151 50.9328 50.9589 49.3151 50.9589 49.3151 50.9589 (61)
 Total heat required for water heating calculated for each month
 240.9410 213.1974 226.5980 199.2607 193.2266 174.1710 171.8121 178.5616 180.4301 201.1466 213.8567 238.2949 (62)
 WWHRs -26.8800 -23.7729 -24.8936 -20.6129 -19.2105 -16.4386 -15.4085 -16.3854 -17.0080 -20.0505 -22.7148 -26.3822 (63a)
 PV diverter -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 (63b)
 Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)
 FGHRs 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)
 Output from w/h 214.0610 189.4244 201.7044 178.6478 174.0161 157.7325 156.4036 162.1762 163.4221 181.0960 191.1419 211.9127 (64)
 Total per year (kWh/year) = Sum(64)m = 2181.7388 (64)
 2182 (64)
 12Total per year (kWh/year)
 Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
 Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
 Heat gains from water heating, kWh/month 75.9088 67.0909 71.1397 62.1857 60.0437 53.8434 52.9256 55.1676 55.9245 62.6771 67.0389 75.0289 (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
 103.1165 103.1165 103.1165 103.1165 103.1165 103.1165 103.1165 103.1165 103.1165 103.1165 103.1165 103.1165 (66)
 Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
 92.6284 102.5529 92.6284 95.7160 92.6284 95.7160 92.6284 92.6284 95.7160 92.6284 95.7160 92.6284 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
 180.1971 182.0670 177.3549 167.3236 154.6607 142.7595 134.8087 132.9388 137.6509 147.6822 160.3451 172.2463 (68)
 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
 33.3116 33.3116 33.3116 33.3116 33.3116 33.3116 33.3116 33.3116 33.3116 33.3116 33.3116 33.3116 (69)
 Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 0.0000 0.0000 0.0000 0.0000 3.0000 3.0000 3.0000 (70)
 Losses e.g. evaporation (negative values) (Table 5)
 -82.4932 -82.4932 -82.4932 -82.4932 -82.4932 -82.4932 -82.4932 -82.4932 -82.4932 -82.4932 -82.4932 -82.4932 (71)
 Water heating gains (Table 5)
 102.0279 99.8376 95.6179 86.3690 80.7040 74.7825 71.1365 74.1500 77.6729 84.2434 93.1095 100.8454 (72)
 Total internal gains 431.7884 441.3924 422.5362 406.3435 384.9280 367.1929 352.5085 353.6522 364.9747 381.4890 406.1055 422.6550 (73)

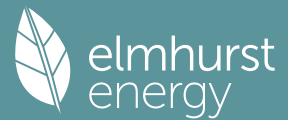
6. Solar gains

[Jan] Area Solar flux g FF Access Gains
 m2 Table 6a W/m2 Specific data or Table 6b Specific data or Table 6c factor Table 6d W
 North 11.4800 10.6334 0.6300 0.7000 0.7700 37.3066 (74)
 Solar gains 37.3066 71.2948 121.1473 194.5936 262.1354 280.6237 261.9981 207.8621 145.6583 84.8671 46.0225 31.1006 (83)
 Total gains 469.0949 512.6872 543.6835 600.9371 647.0634 647.8166 614.5067 561.5143 510.6330 466.3562 452.1280 453.7556 (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 80.4611 80.7216 80.9785 82.2076 82.4417 83.5492 83.5492 83.7576 83.1191 82.4417 81.9694 81.4815
 alpha 6.3641 6.3814 6.3986 6.4805 6.4961 6.5699 6.5699 6.5838 6.5413 6.4961 6.4646 6.4321
 util living area 0.9903 0.9814 0.9594 0.8727 0.6959 0.4877 0.3549 0.4047 0.6563 0.9107 0.9786 0.9919 (86)

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MIT	20.2502	20.3867	20.5817	20.8373	20.9672	20.9971	20.9997	20.9993	20.9830	20.8133	20.5051	20.2319 (87)
Th 2	20.2370	20.2393	20.2415	20.2520	20.2540	20.2632	20.2632	20.2649	20.2597	20.2540	20.2500	20.2459 (88)
util rest of house	0.9876	0.9765	0.9486	0.8443	0.6481	0.4326	0.2956	0.3404	0.5927	0.8832	0.9720	0.9897 (89)
MIT 2	19.3673	19.5411	19.7850	20.0935	20.2280	20.2616	20.2631	20.2646	20.2487	20.0747	19.7001	19.3513 (90)
Living area fraction									fLA = Living area / (4) =			0.4119 (91)
MIT	19.7310	19.8894	20.1132	20.3999	20.5325	20.5646	20.5665	20.5673	20.5511	20.3790	20.0317	19.7141 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7310	19.8894	20.1132	20.3999	20.5325	20.5646	20.5665	20.5673	20.5511	20.3790	20.0317	19.7141 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9854	0.9737	0.9465	0.8503	0.6664	0.4553	0.3201	0.3669	0.6182	0.8883	0.9697	0.9877 (94)
Useful gains	462.2490	499.2022	514.6149	510.9643	431.1893	294.9349	196.6824	206.0236	315.6878	414.2664	438.4060	448.1753 (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	794.8257	769.5895	696.7125	579.7571	444.0201	295.8707	196.7578	206.2020	321.6624	491.5987	653.8357	789.0979 (97)
Space heating kWh	247.4371	181.7003	135.4806	49.5308	9.5461	0.0000	0.0000	0.0000	0.0000	57.5352	155.1094	253.6464 (98a)
Space heating requirement - total per year (kWh/year)												1089.9860
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	247.4371	181.7003	135.4806	49.5308	9.5461	0.0000	0.0000	0.0000	0.0000	57.5352	155.1094	253.6464 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1089.9860
Space heating per m2										(98c) / (4) =		17.3289 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	247.4371	181.7003	135.4806	49.5308	9.5461	0.0000	0.0000	0.0000	0.0000	57.5352	155.1094	253.6464 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	267.7891	196.6454	146.6240	53.6048	10.3313	0.0000	0.0000	0.0000	0.0000	62.2676	167.8673	274.5091 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	214.0610	189.4244	201.7044	178.6478	174.0161	157.7325	156.4036	162.1762	163.4221	181.0960	191.1419	211.9127 (64)
Efficiency of water heater (217)m	84.6928	84.2923	83.5474	82.0224	80.7060	80.3000	80.3000	80.3000	80.3000	82.2176	83.9375	84.7677 (216)
Fuel for water heating, kWh/month	252.7500	224.7234	241.4250	217.8037	215.6173	196.4290	194.7741	201.9629	203.5145	220.2642	227.7194	249.9923 (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	19.2463	15.4401	13.9021	10.1853	7.8674	6.4277	7.1769	9.3288	12.1172	15.8985	17.9573	19.7813 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-16.9225	-25.1090	-37.9659	-44.9832	-50.5355	-47.9248	-47.3510	-43.6973	-37.6023	-29.7204	-19.0471	-14.4889 (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	-6.1020	-13.1192	-26.6070	-40.7500	-54.6544	-55.1893	-54.5295	-45.8059	-33.1065	-19.0062	-8.2256	-4.8038 (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												1179.6385 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2646.9759 (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)												155.3291 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-777.2475 (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												3290.6960 (238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1179.6385	0.2100	247.7241 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2646.9759	0.2100	555.8649 (264)
Space and water heating			803.5890 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	155.3291	0.1443	22.4188 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.3479	0.1335	-55.4562
PV Unit electricity exported	-361.8996	0.1253	-45.3578
Total			-100.8140 (269)
Total CO2, kg/year			737.1231 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7200 (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	1179.6385	1.1300	1332.9915 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2646.9759	1.1300	2991.0828 (278)
Space and water heating			4324.0743 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	155.3291	1.5338	238.2489 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.3479	1.4934	-620.2793
PV Unit electricity exported	-361.8996	0.4600	-166.4848
Total			-786.7641 (283)
Total Primary energy kWh/year			3905.6599 (286)
Target Primary Energy Rate (TPER)			62.0900 (287)

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Property Reference	Be Lean			Issued on Date	06/01/2025
Assessment Reference	FF-Unit 16 (Block A)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	84 B	DER	15.81	TER	14.98
Environmental	88 B	% DER < TER			-5.54
CO ₂ Emissions (t/year)	0.9	DFEE	29.68	TFEE	36.98
Compliance Check	See BREL	% DFEE < TFEE			19.73
% DPER < TPER	-10.59	DPER	88.09	TPER	79.65
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	60.4500 (1b)	x 2.4000 (2b)	= 145.0800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.4500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.0800 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1379 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2879 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2447 (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	0.3120	0.3058	0.2997	0.2691	0.2630	0.2324	0.2324	0.2263	0.2447	0.2630	0.2753	0.2875 (22b)
Effective ac	0.5487	0.5468	0.5449	0.5362	0.5346	0.5270	0.5270	0.5256	0.5299	0.5346	0.5379	0.5413 (25)

3. Heat losses and heat loss parameter

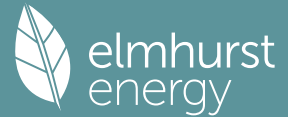
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.00)			11.1100	0.9615	10.6827		(27)
External Wall	38.1400	11.1100	27.0300	0.1300	3.5139	70.0000	1892.1000 (29a)
External Roof	60.4500		60.4500	0.1100	6.6495	9.0000	544.0500 (30)
Total net area of external elements A _{um} (A, m ²)			98.5900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	20.8461			(33)
Party Wall			38.1400	0.0000	0.0000	180.0000	6865.2000 (32)
Party Floor			60.4500			40.0000	2418.0000 (32d)
Internal Wall			98.7800			9.0000	889.0200 (32c)

Heat capacity C_m = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12608.3700 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 208.5752 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.0000	0.3000	1.8000
E3 Sill	3.2000	0.0400	0.1280
E4 Jamb	21.8000	0.0500	1.0900
E7 Party floor between dwellings (in blocks of flats)	11.9000	0.0700	0.8330
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.8900	0.0000	0.0000
E18 Party wall between dwellings	4.8000	0.0600	0.2880
E9 Balcony between dwellings, wall insulation continuous	3.0000	0.0200	0.0600

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E16 Corner (normal)	2.4000	0.0900	0.2160
E15 Flat roof with parapet	15.8900	0.2800	4.4492
P4 Party wall - Roof (insulation at ceiling level)	15.8900	0.1200	1.9068
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.7710 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	31.6171 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	26.2679	26.1774	26.0887	25.6723	25.5943	25.2316	25.2316	25.1644	25.3713	25.5943	25.7520	25.9168 (38)
Heat transfer coeff												
	57.8850	57.7945	57.7058	57.2893	57.2114	56.8487	56.8487	56.7815	56.9884	57.2114	57.3691	57.5339 (39)
Average = Sum(39)m / 12 =												57.2890
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9576	0.9561	0.9546	0.9477	0.9464	0.9404	0.9404	0.9393	0.9427	0.9464	0.9490	0.9518 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	0.9477 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.9943 (42)
Hot water usage for mixer showers													
64.8652	63.8904	62.4699	59.7521	57.7464	55.5097	54.2383	55.6480	57.1934	59.5949	62.3711	64.6166	(42a)	
Hot water usage for baths													
26.2295	25.8399	25.2914	24.2799	23.5226	22.6828	22.2292	22.7739	23.3670	24.2656	25.2979	26.1408	(42b)	
Hot water usage for other uses													
36.8989	35.5571	34.2153	32.8735	31.5318	30.1900	30.1900	31.5318	32.8735	34.2153	35.5571	36.8989	(42c)	
Average daily hot water use (litres/day)													117.6668 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
127.9935	125.2874	121.9766	116.9055	112.8007	108.3824	106.6575	109.9537	113.4339	118.0758	123.2261	127.6563	(44)	
Energy content (annual)	202.7104	178.4076	187.4735	160.0378	151.8515	133.2689	128.9930	136.1456	139.8753	160.2278	175.5581	199.8789	(45)
Distribution loss (46)m = 0.15 x (45)m													1954.4284
30.4066	26.7611	28.1210	24.0057	22.7777	19.9903	19.3489	20.4218	20.9813	24.0342	26.3337	29.9818	(46)	
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	28.3983	25.6409	28.3464	27.3140	28.1520	27.1657	28.0118	28.0478	27.1838	28.1757	27.3775	28.3816	(61)
Total heat required for water heating calculated for each month													
231.1087	204.0485	215.8198	187.3519	180.0035	160.4345	157.0048	164.1935	167.0591	188.4035	202.9357	228.2605	(62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	231.1087	204.0485	215.8198	187.3519	180.0035	160.4345	157.0048	164.1935	167.0591	188.4035	202.9357	228.2605	(64)
12Total per year (kWh/year)													2286.6240 (64)
Electric shower(s)													2287 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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													
74.5008	65.7307	69.4215	60.0411	57.5286	51.1033	49.8931	52.2804	53.3045	60.3197	65.2175	73.5551	(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	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	91.5122	101.3171	91.5122	94.5626	91.5122	94.5626	91.5122	91.5122	94.5626	91.5122	94.5626	91.5122	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.0804	175.8868	171.3347	161.6438	149.4109	137.9136	130.2327	128.4263	132.9784	142.6693	154.9022	166.3995	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	(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)	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	(71)
Water heating gains (Table 5)	100.1355	97.8136	93.3085	83.3904	77.3234	70.9768	67.0606	70.2693	74.0340	81.0748	90.5798	98.8644	(72)
Total internal gains	421.6430	430.9325	412.0704	395.5118	374.1614	356.3680	341.7205	343.1228	354.4900	371.1712	395.9596	412.6911	(73)

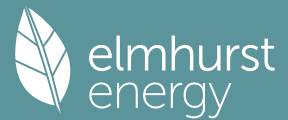
6. Solar gains

[Jan]													
	Area												
	m2												
North	7.0400												
East	4.0700												
Solar gains	42.8019	82.7948	138.4235	211.8181	272.7150	285.9865	269.4039	221.8761	163.6327	98.3927	53.0946	35.4320	(83)
Total gains	464.4449	513.7272	550.4939	607.3300	646.8764	642.3545	611.1244	564.9989	518.1227	469.5639	449.0542	448.1231	(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)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
60.5049	60.5996	60.6927	61.1340	61.2172	61.6079	61.6079	61.6079	61.6808	61.4568	61.2172	61.0490	60.8741	

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alpha	5.0337	5.0400	5.0462	5.0756	5.0811	5.1072	5.1072	5.1121	5.0971	5.0811	5.0699	5.0583
util living area	0.9869	0.9769	0.9551	0.8854	0.7447	0.5525	0.4068	0.4574	0.7038	0.9170	0.9755	0.9889 (86)
MIT	19.9191	20.0883	20.3383	20.6686	20.8927	20.9809	20.9967	20.9941	20.9391	20.6496	20.2344	19.8856 (87)
Th 2	20.1188	20.1201	20.1213	20.1271	20.1282	20.1333	20.1333	20.1342	20.1313	20.1282	20.1260	20.1237 (88)
util rest of house	0.9836	0.9712	0.9438	0.8584	0.6942	0.4831	0.3279	0.3737	0.6334	0.8911	0.9684	0.9861 (89)
MIT 2	19.1431	19.3103	19.5544	19.8675	20.0576	20.1242	20.1323	20.1323	20.0981	19.8582	19.4604	19.1140 (90)
Living area fraction	19.4842	19.6523	19.8989	20.2196	20.4247	20.5008	20.5122	20.5111	20.4678	20.2060	19.8006	19.4531 (91)
MIT	19.4842	19.6523	19.8989	20.2196	20.4247	20.5008	20.5122	20.5111	20.4678	20.2060	19.8006	19.4531 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4842	19.6523	19.8989	20.2196	20.4247	20.5008	20.5122	20.5111	20.4678	20.2060	19.8006	19.4531 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9806	0.9675	0.9405	0.8615	0.7121	0.5130	0.3626	0.4105	0.6618	0.8937	0.9652	0.9834 (94)
Useful gains	455.4208	497.0539	517.7386	523.2356	460.6609	329.5334	221.5930	231.9352	342.9091	419.6624	433.4154	440.6749 (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	878.9362	852.6005	773.1969	648.4928	499.1500	335.4515	222.4050	233.4357	362.8891	549.5742	728.6221	877.5721 (97)
Space heating kWh	315.0954	238.9273	190.0609	90.1852	28.6359	0.0000	0.0000	0.0000	0.0000	96.6544	212.5489	325.0516 (98a)
Space heating requirement - total per year (kWh/year)												1497.1596
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	315.0954	238.9273	190.0609	90.1852	28.6359	0.0000	0.0000	0.0000	0.0000	96.6544	212.5489	325.0516 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1497.1596
Space heating per m2										(98c) / (4) =		24.7669 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												83.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	315.0954	238.9273	190.0609	90.1852	28.6359	0.0000	0.0000	0.0000	0.0000	96.6544	212.5489	325.0516 (98)
Space heating efficiency (main heating system 1)	83.4000	83.4000	83.4000	83.4000	83.4000	0.0000	0.0000	0.0000	0.0000	83.4000	83.4000	83.4000 (210)
Space heating fuel (main heating system)	377.8123	286.4836	227.8908	108.1357	34.3356	0.0000	0.0000	0.0000	0.0000	115.8926	254.8548	389.7501 (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	231.1087	204.0485	215.8198	187.3519	180.0035	160.4345	157.0048	164.1935	167.0591	188.4035	202.9357	228.2605 (64)
Efficiency of water heater (217)m	88.3153	88.3078	88.2935	88.2649	88.2274	88.2000	88.2000	88.2000	88.2000	88.2677	88.3022	88.3174 (217)
Fuel for water heating, kWh/month	261.6861	231.0652	244.4345	212.2609	204.0222	181.8986	178.0099	186.1604	189.4094	213.4455	229.8195	258.4548 (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	19.2845	15.4707	13.9297	10.2055	7.8830	6.4405	7.1911	9.3473	12.1412	15.9299	17.9928	19.8204 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1795.1554 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												88.2000
Water heating fuel used												2590.6670 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												155.6366 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												4627.4590 (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	1795.1554	0.2100	376.9826 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2590.6670	0.2100	544.0401 (264)
Space and water heating			921.0227 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	155.6366	0.1443	22.4632 (268)
Total CO2, kg/year			955.4151 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.8100 (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	1795.1554	1.1300	2028.5256 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2590.6670	1.1300	2927.4537 (278)
Space and water heating			4955.9793 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	155.6366	1.5338	238.7207 (282)
Total Primary energy kWh/year			5324.8007 (286)
Dwelling Primary energy Rate (DPER)			88.0900 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	60.4500 (1b)	x 2.4000 (2b)	= 145.0800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.4500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.0800 (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) = 0.1379 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3879 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3297 (21)

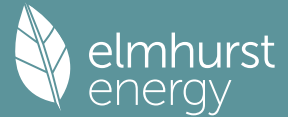
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4203	0.4121	0.4039	0.3626	0.3544	0.3132	0.3132	0.3050	0.3297	0.3544	0.3709	0.3874 (22b)
Effective ac	0.5883	0.5849	0.5815	0.5658	0.5628	0.5490	0.5490	0.5465	0.5543	0.5628	0.5688	0.5750 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			11.1100	1.1450	12.7214		(27)
External Wall	38.1400	11.1100	27.0300	0.1800	4.8654		(29a)
External Roof	60.4500		60.4500	0.1100	6.6495		(30)
Total net area of external elements Aum(A, m2)			98.5900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2363		(33)
Party Wall			38.1400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.5752 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.0000	0.0500	0.3000	

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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	52.9403	53.0720	53.2018	53.8200	53.9372	54.4899	54.4899	54.5935	54.2757	53.9372	53.7006	53.4553
alpha	4.5294	4.5381	4.5468	4.5880	4.5958	4.6327	4.6327	4.6396	4.6184	4.5958	4.5800	4.5637
util living area	0.9882	0.9796	0.9605	0.8996	0.7724	0.5854	0.4362	0.4907	0.7388	0.9295	0.9786	0.9899 (86)
MIT	19.6719	19.8584	20.1462	20.5409	20.8298	20.9637	20.9925	20.9873	20.8971	20.5242	20.0414	19.6443 (87)
Th 2	20.0054	20.0076	20.0098	20.0201	20.0220	20.0309	20.0309	20.0326	20.0275	20.0220	20.0181	20.0140 (88)
util rest of house	0.9851	0.9743	0.9499	0.8734	0.7194	0.5065	0.3429	0.3924	0.6633	0.9051	0.9721	0.9873 (89)
MIT 2	18.4717	18.7091	19.0713	19.5567	19.8775	20.0090	20.0282	20.0275	19.9550	19.5493	18.9504	18.4428 (90)
Living area fraction									fLA = Living area /	(4) =		0.4395 (91)
MIT	18.9992	19.2143	19.5437	19.9893	20.2961	20.4286	20.4520	20.4494	20.3691	19.9778	19.4299	18.9709 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9992	19.2143	19.5437	19.9893	20.2961	20.4286	20.4520	20.4494	20.3691	19.9778	19.4299	18.9709 (93)

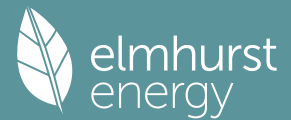
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9809	0.9688	0.9439	0.8724	0.7352	0.5398	0.3839	0.4355	0.6915	0.9038	0.9670	0.9835 (94)
Useful gains	458.1561	504.2801	532.0863	548.8231	496.7187	363.1952	245.7145	256.4915	370.4027	433.5142	438.5447	442.6660 (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	972.4450	944.6250	858.6805	721.6340	558.1708	374.6336	247.5871	259.7790	404.5365	608.9294	804.1529	967.7691 (97)
Space heating kWh	382.6310	295.9118	242.9860	124.4238	45.7203	0.0000	0.0000	0.0000	0.0000	130.5089	263.2379	390.6767 (98a)
Space heating requirement - total per year (kWh/year)												1876.0965
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	382.6310	295.9118	242.9860	124.4238	45.7203	0.0000	0.0000	0.0000	0.0000	130.5089	263.2379	390.6767 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1876.0965
Space heating per m2										(98c) / (4) =		31.0355 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	382.6310	295.9118	242.9860	124.4238	45.7203	0.0000	0.0000	0.0000	0.0000	130.5089	263.2379	390.6767 (98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)	
Space heating fuel (main heating system)	414.1028	320.2509	262.9719	134.6578	49.4809	0.0000	0.0000	0.0000	0.0000	141.2434	284.8895	422.8103 (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	210.8970	186.6428	198.7803	176.1391	171.6292	155.4180	153.3698	160.0188	161.2086	178.5716	188.3907	208.7904 (64)	
Efficiency of water heater	85.6409	85.3639	84.8128	83.6499	81.9680	80.3000	80.3000	80.3000	80.3000	83.7197	85.0983	85.7031 (216)	
Fuel for water heating, kWh/month	246.2573	218.6437	234.3753	210.5670	209.3856	193.5467	190.9960	199.2762	200.7579	213.2968	221.3802	243.6205 (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	18.5733	14.9002	13.4160	9.8291	7.5923	6.2030	6.9260	9.0026	11.6935	15.3425	17.3293	19.0896 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-16.2835	-24.1718	-36.5663	-43.3478	-48.7209	-46.2151	-45.6646	-42.1315	-36.2387	-28.6234	-18.3326	-13.9408 (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)	-5.8442	-12.5674	-25.4916	-39.0460	-52.3718	-52.8826	-52.2476	-43.8856	-31.7159	-18.2053	-7.8779	-4.6005 (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													2030.4074 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													2582.1032 (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)													149.8975 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-746.9732 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)

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Appendix Q - special features

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4101.4350 (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	2030.4074	0.2100	426.3856 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2582.1032	0.2100	542.2417 (264)
Space and water heating			968.6272 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	149.8975	0.1443	21.6348 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-400.2369	0.1335	-53.4340
PV Unit electricity exported	-346.7362	0.1253	-43.4567
Total			-96.8907 (269)
Total CO2, kg/year			905.3006 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.9800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2030.4074	1.1300	2294.3604 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2582.1032	1.1300	2917.7766 (278)
Space and water heating			5212.1370 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	149.8975	1.5338	229.9178 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-400.2369	1.4934	-597.6954
PV Unit electricity exported	-346.7362	0.4600	-159.5068
Total			-757.2022 (283)
Total Primary energy kWh/year			4814.9535 (286)
Target Primary Energy Rate (TPER)			79.6500 (287)

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Property Reference	Be Lean			Issued on Date	06/01/2025
Assessment Reference	GF-Unit 1 (Block B)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	84 B	DER	17.54	TER	15.76
Environmental	90 B	% DER < TER			-11.29
CO ₂ Emissions (t/year)	0.64	DFEE	25.71	TFEE	27.98
Compliance Check	See BREL	% DFEE < TFEE			8.11
% DPER < TPER	-16.26	DPER	98.17	TPER	84.44
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	38.5900 (1b)	2.5000 (2b)	96.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.5900		96.4750 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	96.4750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.2073 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.3573 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3037 (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	0.3872	0.3796	0.3720	0.3341	0.3265	0.2885	0.2885	0.2809	0.3037	0.3265	0.3417	0.3569 (22b)
Effective ac	0.5750	0.5721	0.5692	0.5558	0.5533	0.5416	0.5416	0.5395	0.5461	0.5533	0.5584	0.5637 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.00)			6.1600	0.9615	5.9231		(27)
Heatloss Floor			38.5900	0.1300	5.0167	110.0000	4244.9000 (28a)
External Wall	34.7500	6.1600	28.5900	0.1300	3.7167	70.0000	2001.3000 (29a)
Total net area of external elements A _{um} (A, m ²)			73.3400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	14.6565			(33)
Party Wall			34.7500	0.0000	0.0000	180.0000	6255.0000 (32)
Party Ceiling			38.5900			30.0000	1157.7000 (32b)
Internal Wall			66.3000			9.0000	596.7000 (32c)

Heat capacity C_m = Sum(A x k)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 14255.6000 (34)
369.4118 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	3.7500	0.3000	1.1250
E3 Sill	2.8000	0.0400	0.1120
E4 Jamb	13.0000	0.0500	0.6500
E5 Ground floor (normal)	13.9000	0.1600	2.2240
E7 Party floor between dwellings (in blocks of flats)	13.9000	0.0700	0.9730
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	5.0000	0.0600	0.3000

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P1 Party wall - Ground floor	13.9000	0.1600	2.2240	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.9000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.8330 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =		22.4895 (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	18.3053	18.2126	18.1218	17.6950	17.6152	17.2435	17.2435	17.1747	17.3867	17.6152	17.7767	17.9456 (38)
Average = Sum(39)m / 12 =	40.7948	40.7021	40.6113	40.1845	40.1047	39.7330	39.7330	39.6642	39.8762	40.1047	40.2662	40.4351 (39)
												40.1841
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0571	1.0547	1.0524	1.0413	1.0393	1.0296	1.0296	1.0278	1.0333	1.0393	1.0434	1.0478 (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												1.3694 (42)
Hot water usage for mixer showers												
53.0769	52.2793	51.1169	48.8931	47.2519	45.4217	44.3814	45.5349	46.7994	48.7645	51.0361	52.8736 (42a)	
Hot water usage for baths												
21.4863	21.1672	20.7178	19.8893	19.2689	18.5809	18.2093	18.6556	19.1414	19.8775	20.7231	21.4136 (42b)	
Hot water usage for other uses												
30.1620	29.0652	27.9684	26.8716	25.7748	24.6780	24.6780	25.7748	26.8716	27.9684	29.0652	30.1620 (42c)	
Average daily hot water use (litres/day)												96.2763 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	104.7252	102.5116	99.8031	95.6539	92.2955	88.6806	87.2687	89.9652	92.8123	96.6104	100.8244	104.4492 (44)
Energy conte	165.8590	145.9752	153.3937	130.9454	124.2475	109.0431	105.5439	111.3957	114.4469	131.0993	143.6429	163.5421 (45)
Energy content (annual)										Total = Sum(45)m =		1599.1348
Distribution loss (46)m = 0.15 x (45)m												
24.8789	21.8963	23.0091	19.6418	18.6371	16.3565	15.8316	16.7094	17.1670	19.6649	21.5464	24.5313 (46)	
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	28.3293	25.5722	28.2583	27.1521	27.9317	26.9094	27.7399	27.8088	26.9903	28.0336	27.3039	28.3123 (61)
Total heat required for water heating calculated for each month												
194.1883	171.5473	181.6520	158.0975	152.1792	135.9525	133.2838	139.2046	141.4372	159.1329	170.9468	191.8545 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	194.1883	171.5473	181.6520	158.0975	152.1792	135.9525	133.2838	139.2046	141.4372	159.1329	170.9468	191.8545 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1929.4764 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	62.2304	54.9298	58.0680	50.3274	48.2952	42.9842	42.0283	43.9913	44.8012	50.5989	54.5872	61.4558 (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
68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
63.8861	70.7310	63.8861	66.0156	63.8861	66.0156	63.8861	63.8861	66.0156	63.8861	66.0156	63.8861	63.8861 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
118.0043	119.2288	116.1431	109.5739	101.2815	93.4878	88.2812	87.0566	90.1424	96.7116	105.0040	112.7976 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469 (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)												
-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754 (71)
Water heating gains (Table 5)												
83.6431	81.7407	78.0483	69.8991	64.9129	59.7002	56.4897	59.1281	62.2238	68.0093	75.8156	82.6019 (72)	
Total internal gains	312.0742	318.2413	304.6183	292.0294	276.6213	262.7444	252.1977	253.6116	261.9226	275.1477	293.3759	305.8264 (73)

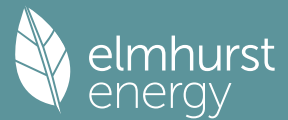
6. Solar gains

[Jan]														
	Area				Solar flux		g		FF		Access		Gains	
	m2				Table 6a		Specific data		Specific data		factor		W	
					W/m2		or Table 6b		or Table 6c		Table 6d			
South	6.1600				46.7521		0.5700		0.7000		0.7700		79.6320 (78)	
Solar gains	79.6320	130.4167	166.1277	187.7604	195.6580	188.2942	183.9749	178.6651	173.5400	140.6666	94.3911	68.8094 (83)		
Total gains	391.7062	448.6580	470.7460	479.7898	472.2792	451.0386	436.1725	432.2766	435.4626	415.8143	387.7670	374.6358 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	97.0685	97.2895	97.5072	98.5426	98.7388	99.6624	99.6624	99.8354	99.3046	98.7388	98.3428	97.9321
util living area	7.4712	7.4860	7.5005	7.5695	7.5826	7.6442	7.6442	7.6557	7.6203	7.5826	7.5562	7.5288

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	0.9931	0.9807	0.9560	0.8891	0.7578	0.5607	0.4006	0.4217	0.6247	0.8848	0.9799	0.9949 (86)
MIT	20.4034	20.5603	20.7164	20.8780	20.9691	20.9971	20.9998	20.9997	20.9936	20.8994	20.6324	20.3733 (87)
Th 2	20.0360	20.0380	20.0399	20.0490	20.0508	20.0587	20.0587	20.0602	20.0557	20.0508	20.0473	20.0437 (88)
util rest of house												
	0.9901	0.9729	0.9388	0.8509	0.6931	0.4799	0.3150	0.3358	0.5429	0.8387	0.9703	0.9926 (89)
MIT 2	19.5172	19.6711	19.8194	19.9677	20.0352	20.0579	20.0587	20.0602	20.0535	19.9888	19.7505	19.4943 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	19.8881	20.0432	20.1948	20.3486	20.4261	20.4510	20.4526	20.4534	20.4469	20.3699	20.1196	19.8622 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8881	20.0432	20.1948	20.3486	20.4261	20.4510	20.4526	20.4534	20.4469	20.3699	20.1196	19.8622 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9895	0.9729	0.9420	0.8639	0.7196	0.5138	0.3509	0.3718	0.5773	0.8556	0.9712	0.9921	(94)
Useful gains	387.6106	436.5093	443.4245	414.5047	339.8482	231.7633	153.0402	160.7212	251.3789	355.7634	376.5801	371.6633	(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													
	635.9123	616.3615	556.1635	460.0580	349.9562	232.4760	153.0734	160.7732	253.0906	391.8175	524.2502	633.3006	(97)
Space heating kWh													
	184.7364	120.8606	83.8778	32.7983	7.5203	0.0000	0.0000	0.0000	0.0000	26.8243	106.3225	194.6581	(98a)
Space heating requirement - total per year (kWh/year)												757.5985	
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													
	184.7364	120.8606	83.8778	32.7983	7.5203	0.0000	0.0000	0.0000	0.0000	26.8243	106.3225	194.6581	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												757.5985	
Space heating per m2												19.6320	(99)
										(98c) / (4) =			

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													83.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	184.7364	120.8606	83.8778	32.7983	7.5203	0.0000	0.0000	0.0000	0.0000	26.8243	106.3225	194.6581	(98)
Space heating efficiency (main heating system 1)													
	83.4000	83.4000	83.4000	83.4000	83.4000	0.0000	0.0000	0.0000	0.0000	83.4000	83.4000	83.4000	(210)
Space heating fuel (main heating system)													
	221.5065	144.9168	100.5729	39.3265	9.0172	0.0000	0.0000	0.0000	0.0000	32.1634	127.4850	233.4030	(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													
	194.1883	171.5473	181.6520	158.0975	152.1792	135.9525	133.2838	139.2046	141.4372	159.1329	170.9468	191.8545	(64)
Efficiency of water heater (217)m													
	88.2974	88.2826	88.2631	88.2343	88.2094	88.2000	88.2000	88.2000	88.2000	88.2288	88.2766	88.3006	(217)
Fuel for water heating, kWh/month													
	219.9253	194.3162	205.8074	179.1791	172.5204	154.1411	151.1154	157.8283	160.3596	180.3639	193.6490	217.2742	(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													
	13.0029	10.4314	9.3924	6.8812	5.3153	4.3426	4.8488	6.3026	8.1865	10.7411	12.1320	13.3643	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													908.3914 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													88.2000
Water heating fuel used													2186.4801 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													86.0000 (231)
Electricity for lighting (calculated in Appendix L)													104.9412 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													0.0000 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													3285.8127 (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	908.3914	0.2100	190.7622 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2186.4801	0.2100	459.1608 (264)
Space and water heating			649.9230 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	104.9412	0.1443	15.1463 (268)
Total CO2, kg/year			676.9985 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			17.5400 (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	908.3914	1.1300	1026.4823 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2186.4801	1.1300	2470.7225 (278)
Space and water heating			3497.2048 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	104.9412	1.5338	160.9623 (282)
Total Primary energy kWh/year			3788.2679 (286)
Dwelling Primary energy Rate (DPER)			98.1700 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	38.5900 (1b)	x 2.5000 (2b)	= 96.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.5900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 96.4750 (5)

2. Ventilation rate

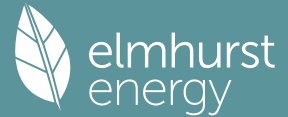
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.2073 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4573 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3887 (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	0.4956	0.4859	0.4762	0.4276	0.4179	0.3693	0.3693	0.3596	0.3887	0.4179	0.4373	0.4567 (22b)
Effective ac	0.6228	0.6180	0.6134	0.5914	0.5873	0.5682	0.5682	0.5646	0.5755	0.5873	0.5956	0.6043 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			6.1600	1.1450	7.0534		(27)
Heatloss Floor			38.5900	0.1300	5.0167		(28a)
External Wall	34.7500	6.1600	28.5900	0.1800	5.1462		(29a)
Total net area of external elements Aum(A, m2)			73.3400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.2163		(33)
Party Wall			34.7500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							379.4118 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				3.7500	0.0500	0.1875	
E3 Sill				2.8000	0.0500	0.1400	
E4 Jamb				13.0000	0.0500	0.6500	

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E5 Ground floor (normal)	13.9000	0.1600	2.2240	
E7 Party floor between dwellings (in blocks of flats)	13.9000	0.0700	0.9730	
E16 Corner (normal)	2.5000	0.0900	0.2250	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
P1 Party wall - Ground floor	13.9000	0.0800	1.1120	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.9000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.8115 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		23.0278 (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	19.8283	19.6765	19.5277	18.8287	18.6979	18.0891	18.0891	17.9763	18.3236	18.6979	18.9625	19.2391 (38)
Average = Sum(39)m / 12 =	42.8562	42.7044	42.5555	41.8565	41.7257	41.1169	41.1169	41.0042	41.3514	41.7257	41.9903	42.2669 (39)
												41.8559
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1106	1.1066	1.1028	1.0846	1.0813	1.0655	1.0655	1.0626	1.0716	1.0813	1.0881	1.0953 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

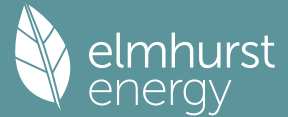
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.3694 (42)
Hot water usage for mixer showers												
	47.1795	46.4705	45.4373	43.4605	42.0017	40.3748	39.4501	40.4754	41.5994	43.3462	45.3654	46.9987 (42a)
Hot water usage for baths												
	20.4120	20.1088	19.6819	18.8948	18.3054	17.6519	17.2989	17.7228	18.1843	18.8836	19.6870	20.3429 (42b)
Hot water usage for other uses												
	28.6539	27.6119	26.5700	25.5280	24.4860	23.4441	23.4441	24.4860	25.5280	26.5700	27.6119	28.6539 (42c)
Average daily hot water use (litres/day)												88.4720 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	96.2453	94.1912	91.6892	87.8833	84.7931	81.4708	80.1931	82.6843	85.3118	88.7998	92.6643	95.9955 (44)
Energy conte	152.4290	134.1270	140.9228	120.3078	114.1478	100.1778	96.9865	102.3804	105.1979	120.5005	132.0173	150.3058 (45)
Energy content (annual)										Total = Sum(45)m =		1469.5009
Distribution loss (46)m = 0.15 x (45)m												
	22.8644	20.1190	21.1384	18.0462	17.1222	15.0267	14.5480	15.3571	15.7797	18.0751	19.8026	22.5459 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	49.0456	43.3538	46.7238	43.3397	43.2096	40.1774	40.8655	42.1350	42.0716	45.2514	45.6975	48.9183 (61)
Total heat required for water heating calculated for each month												
	201.4746	177.4807	187.6466	163.6475	157.3575	140.3552	137.8520	144.5154	147.2695	165.7519	177.7148	199.2241 (62)
WWHRS	-21.5685	-19.0753	-19.9746	-16.5398	-15.4145	-13.1903	-12.3638	-13.1476	-13.6472	-16.0885	-18.2263	-21.1691 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	179.9061	158.4054	167.6720	147.1078	141.9430	127.1649	125.4883	131.3678	133.6223	149.6634	159.4885	178.0550 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				1799.8845 (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	1800 (64)
												0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	62.9440	55.4357	58.5378	50.8373	48.7566	43.3535	42.4644	44.5752	45.4962	51.3793	55.3201	62.2063 (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	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	62.1243	68.7804	62.1243	64.1951	62.1243	64.1951	62.1243	62.1243	64.1951	62.1243	64.1951	62.1243 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	118.0043	119.2288	116.1431	109.5739	101.2815	93.4878	88.2812	87.0566	90.1424	96.7116	105.0040	112.7976 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469 (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)	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754 (71)
Water heating gains (Table 5)	84.6022	82.4935	78.6798	70.6073	65.5330	60.2131	57.0758	59.9129	63.1892	69.0581	76.8335	83.6106 (72)
Total internal gains	311.2716	317.0436	303.4880	290.9171	275.4796	261.4368	251.0220	252.6346	261.0674	274.4348	292.5733	305.0733 (73)

6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
South	6.1600	46.7521	0.6300	0.7000	0.7700	88.0143 (78)						
Solar gains	88.0143	144.1448	183.6149	207.5247	216.2535	208.1146	203.3406	197.4719	191.8074	155.4737	104.3270	76.0525 (83)
Total gains	399.2859	461.1884	487.1028	498.4418	491.7331	469.5514	454.3627	450.1066	452.8748	429.9084	396.9003	381.1257 (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)												

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	94.9007	95.2381	95.5712	97.1673	97.4718	98.9151	98.9151	99.1871	98.3541	97.4718	96.8577	96.2238
alpha	7.3267	7.3492	7.3714	7.4778	7.4981	7.5943	7.5943	7.6125	7.5569	7.4981	7.4572	7.4149
util living area	0.9938	0.9819	0.9572	0.8890	0.7566	0.5574	0.3980	0.4187	0.6228	0.8864	0.9812	0.9954 (86)
MIT	20.3682	20.5347	20.7010	20.8740	20.9682	20.9971	20.9998	20.9997	20.9935	20.8948	20.6141	20.3434 (87)
Th 2	19.9922	19.9954	19.9986	20.0134	20.0162	20.0291	20.0291	20.0315	20.0241	20.0162	20.0106	20.0047 (88)
util rest of house	0.9910	0.9741	0.9398	0.8494	0.6896	0.4745	0.3103	0.3308	0.5385	0.8390	0.9718	0.9932 (89)
MIT 2	19.2884	19.4984	19.7017	19.9068	19.9960	20.0281	20.0291	20.0315	20.0213	19.9340	19.6117	19.2673 (90)
Living area fraction	19.7403	19.9321	20.1199	20.3116	20.4029	20.4336	20.4353	20.4367	FLA = Living area / (4) =	20.3361	20.0312	0.4185 (91)
MIT	19.7403	19.9321	20.1199	20.3116	20.4029	20.4336	20.4353	20.4367	20.4282	20.3361	20.0312	19.7177 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7403	19.9321	20.1199	20.3116	20.4029	20.4336	20.4353	20.4367	20.4282	20.3361	20.0312	19.7177 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9901	0.9735	0.9422	0.8624	0.7170	0.5093	0.3470	0.3676	0.5739	0.8559	0.9720	0.9924 (94)
Useful gains	395.3161	448.9879	458.9587	429.8623	352.5487	239.1440	157.6638	165.4691	259.9128	367.9488	385.8001	378.2444 (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	661.7128	641.9373	579.6009	477.6492	363.1341	239.8607	157.6971	165.5207	261.6794	406.2458	542.9858	655.8839 (97)
Space heating kWh	198.1991	129.6620	89.7577	34.4066	7.8755	0.0000	0.0000	0.0000	0.0000	28.4930	113.1737	206.5638 (98a)
Space heating requirement - total per year (kWh/year)												808.1315
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	198.1991	129.6620	89.7577	34.4066	7.8755	0.0000	0.0000	0.0000	0.0000	28.4930	113.1737	206.5638 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												808.1315
Space heating per m2										(98c) / (4) =		20.9415 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	198.1991	129.6620	89.7577	34.4066	7.8755	0.0000	0.0000	0.0000	0.0000	28.4930	113.1737	206.5638 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	214.5012	140.3269	97.1404	37.2366	8.5233	0.0000	0.0000	0.0000	0.0000	30.8366	122.4824	223.5539 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	179.9061	158.4054	167.6720	147.1078	141.9430	127.1649	125.4883	131.3678	133.6223	149.6634	159.4885	178.0550 (64)
Efficiency of water heater (217)m	84.5895	83.9557	83.1030	81.8000	80.7104	80.3000	80.3000	80.3000	80.3000	81.5619	83.6592	84.7005 (216)
Fuel for water heating, kWh/month	212.6815	188.6775	201.7640	179.8384	175.8670	158.3623	156.2743	163.5962	166.4039	183.4967	190.6408	210.2171 (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	12.9082	10.3554	9.3239	6.8311	5.2765	4.3110	4.8134	6.2567	8.1268	10.6628	12.0436	13.2670 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-10.5548	-15.7548	-23.9707	-28.5982	-32.3234	-30.7512	-30.4102	-27.9837	-23.9430	-18.7573	-11.9212	-9.0284 (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)	-3.5710	-7.6987	-15.6457	-24.0003	-32.2120	-32.5107	-32.0949	-26.9277	-19.4378	-11.1372	-4.8110	-2.8079 (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												874.6012 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2187.8198 (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)												104.1765 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-476.8519 (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												2775.7457 (238)

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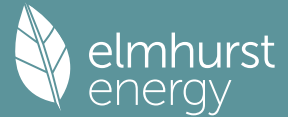
----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	874.6012	0.2100	183.6663 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2187.8198	0.2100	459.4422 (264)
Space and water heating			643.1084 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	104.1765	0.1443	15.0359 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-263.9969	0.1334	-35.2086
PV Unit electricity exported	-212.8549	0.1253	-26.6725
Total			-61.8811 (269)
Total CO2, kg/year			608.1925 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.7600 (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	874.6012	1.1300	988.2994 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2187.8198	1.1300	2472.2363 (278)
Space and water heating			3460.5357 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	104.1765	1.5338	159.7895 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-263.9969	1.4928	-394.1034
PV Unit electricity exported	-212.8549	0.4599	-97.9010
Total			-492.0044 (283)
Total Primary energy kWh/year			3258.4216 (286)
Target Primary Energy Rate (TPER)			84.4400 (287)

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Property Reference	Be Lean			Issued on Date	06/01/2025
Assessment Reference	GF-Unit 4 (Block A)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	84 B	DER	15.70	TER	13.88
Environmental	88 B	% DER < TER			-13.11
CO ₂ Emissions (t/year)	0.98	DFEE	31.25	TFEE	34.51
Compliance Check	See BREL	% DFEE < TFEE			9.44
% DPER < TPER	-18.75	DPER	87.55	TPER	73.73
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	67.1100 (1b)	2.5000 (2b)	167.7750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.1100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	167.7750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1192 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2692 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2288 (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	0.2918	0.2860	0.2803	0.2517	0.2460	0.2174	0.2174	0.2117	0.2288	0.2460	0.2574	0.2689 (22b)
Effective ac	0.5426	0.5409	0.5393	0.5317	0.5303	0.5236	0.5236	0.5224	0.5262	0.5303	0.5331	0.5361 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.00)			10.5600	0.9615	10.1538		(27)
Heatloss Floor			67.1100	0.1300	8.7243	110.0000	7382.1000 (28a)
External Wall	67.1100	10.5600	56.5500	0.1300	7.3515	70.0000	3958.5000 (29a)
Total net area of external elements A _{um} (A, m ²)			134.2200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.2296		(33)
Party Wall			42.4500	0.0000	0.0000	180.0000	7641.0000 (32)
Party Ceiling			67.1100			30.0000	2013.3000 (32b)
Internal Wall			112.8500			9.0000	1015.6500 (32c)

Heat capacity C_m = Sum(A x k)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 22010.5500 (34)
327.9772 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.7500	0.3000	1.7250
E3 Sill	4.8000	0.0400	0.1920
E4 Jamb	21.8000	0.0500	1.0900
E5 Ground floor (normal)	16.9900	0.1600	2.7184
E7 Party floor between dwellings (in blocks of flats)	16.9900	0.0700	1.1893
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	5.0000	0.0600	0.3000

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P1 Party wall - Ground floor	16.9900	0.1600	2.7184
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.9900	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.1581 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	36.3877 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	30.0392	29.9477	29.8581	29.4368	29.3580	28.9911	28.9911	28.9231	29.1324	29.3580	29.5174	29.6841 (38)
Average = Sum(39)m / 12 =	66.4270	66.3355	66.2458	65.8245	65.7457	65.3788	65.3788	65.3109	65.5201	65.7457	65.9052	66.0719 (39)
												65.8242
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9898	0.9885	0.9871	0.9808	0.9797	0.9742	0.9742	0.9732	0.9763	0.9797	0.9820	0.9845 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1740 (42)
Hot water usage for mixer showers													
68.2537	67.2280	65.7333	62.8735	60.7631	58.4095	57.0717	58.5551	60.1812	62.7082	65.6294	67.9922	(42a)	
Hot water usage for baths													
27.5929	27.1832	26.6061	25.5421	24.7453	23.8619	23.3847	23.9577	24.5817	25.5270	26.6129	27.4997	(42b)	
Hot water usage for other uses													
38.8354	37.4232	36.0110	34.5988	33.1866	31.7744	31.7744	33.1866	34.5988	36.0110	37.4232	38.8354	(42c)	
Average daily hot water use (litres/day)												123.8156 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
134.6821	131.8344	128.3504	123.0144	118.6950	114.0458	112.2309	115.6994	119.3616	124.2461	129.6655	134.3273	(44)	
Energy content (annual)	213.3035	187.7304	197.2698	168.4006	159.7863	140.2326	135.7335	143.2601	147.1848	168.6008	184.7323	210.3240 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =	2056.5586		
31.9955	28.1596	29.5905	25.2601	23.9679	21.0349	20.3600	21.4890	22.0777	25.2901	27.7098	31.5486	(46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	28.4023	25.6470	28.3561	27.3267	28.1674	27.1823	28.0291	28.0637	27.1975	28.1874	27.3855	28.3858 (61)	
Total heat required for water heating calculated for each month													
241.7058	213.3774	225.6259	195.7273	187.9537	167.4149	163.7626	171.3238	174.3823	196.7882	212.1177	238.7099	(62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	241.7058	213.3774	225.6259	195.7273	187.9537	167.4149	163.7626	171.3238	174.3823	196.7882	212.1177	238.7099 (64)	
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 2388.8893 (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	78.0240	68.8321	72.6812	62.8249	60.1708	53.4229	52.1387	54.6499	55.7383	63.1066	68.2698	77.0292 (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	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
103.4362	114.5186	103.4362	106.8840	103.4362	106.8840	103.4362	103.4362	106.8840	103.4362	106.8840	103.4362	103.4362 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
190.4603	192.4366	187.4562	176.8535	163.4695	150.8904	142.4868	140.5104	145.4908	156.0935	169.4775	182.0566	182.0566 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699 (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)												
-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588 (71)
Water heating gains (Table 5)												
104.8709	102.4287	97.6898	87.2567	80.8747	74.1985	70.0788	73.4542	77.4143	84.8207	94.8192	103.5339	103.5339 (72)
Total internal gains	457.3769	467.9935	447.1918	429.6039	406.3899	387.5825	371.6113	373.0103	385.3987	402.9600	429.7904	447.6363 (73)

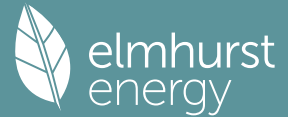
6. Solar gains

[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				3.5200	10.6334		0.5700		0.7000		0.7700	10.3495 (74)
West				7.0400	19.6403		0.5700		0.7000		0.7700	38.2319 (80)
Solar gains	48.5814	94.5682	156.7765	233.6171	292.8685	303.2101	287.2349	241.9616	183.6578	112.2880	60.4382	40.0679 (83)
Total gains	505.9584	562.5618	603.9683	663.2209	699.2584	690.7926	658.8462	614.9719	569.0565	515.2480	490.2286	487.7042 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	92.0415	92.1685	92.2933	92.8839	92.9953	93.5172	93.5172	93.6145	93.3155	92.9953	92.7703	92.5362
	7.1361	7.1446	7.1529	7.1923	7.1997	7.2345	7.2345	7.2410	7.2210	7.1997	7.1847	7.1691

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util living area	0.9980	0.9951	0.9863	0.9423	0.8118	0.5993	0.4360	0.4871	0.7579	0.9644	0.9948	0.9985 (86)
MIT	20.2070	20.3331	20.5210	20.7746	20.9425	20.9941	20.9995	20.9989	20.9727	20.7544	20.4372	20.1818 (87)
Th 2	20.0918	20.0930	20.0941	20.0993	20.1003	20.1049	20.1049	20.1057	20.1031	20.1003	20.0983	20.0962 (88)
util rest of house												
MIT 2	0.9971	0.9931	0.9803	0.9191	0.7543	0.5188	0.3477	0.3933	0.6756	0.9448	0.9922	0.9978 (89)
Living area fraction	19.3774	19.5035	19.6892	19.9316	20.0677	20.1028	20.1048	20.1055	20.0915	19.9192	19.6119	19.3561 (90)
MIT	19.6643	19.7904	19.9769	20.2232	20.3702	20.4111	20.4142	20.4145	20.3962	20.2081	19.8974	19.6417 (91)
Temperature adjustment												0.0000
adjusted MIT	19.6643	19.7904	19.9769	20.2232	20.3702	20.4111	20.4142	20.4145	20.3962	20.2081	19.8974	19.6417 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9966	0.9922	0.9794	0.9227	0.7726	0.5467	0.3783	0.4258	0.7039	0.9476	0.9914	0.9974	(94)
Useful gains	504.2463	558.1780	591.5193	611.9631	540.2627	377.6443	249.2315	261.8751	400.5598	488.2680	486.0164	486.4196	(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	1020.6054	987.7628	892.7867	745.3424	570.0308	379.9228	249.3689	262.1889	412.5305	631.6911	843.4119	1020.2603	(97)
Space heating kWh	384.1712	288.6810	224.1430	96.0331	22.1474	0.0000	0.0000	0.0000	0.0000	106.7068	257.3248	397.1775	(98a)
Space heating requirement - total per year (kWh/year)												1776.3848	
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	384.1712	288.6810	224.1430	96.0331	22.1474	0.0000	0.0000	0.0000	0.0000	106.7068	257.3248	397.1775	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1776.3848	
Space heating per m2										(98c) / (4) =		26.4697	(99)

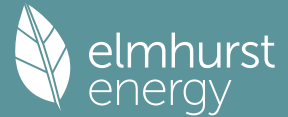
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													83.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	384.1712	288.6810	224.1430	96.0331	22.1474	0.0000	0.0000	0.0000	0.0000	106.7068	257.3248	397.1775	(98)
Space heating efficiency (main heating system 1)	83.4000	83.4000	83.4000	83.4000	83.4000	0.0000	0.0000	0.0000	0.0000	83.4000	83.4000	83.4000	(210)
Space heating fuel (main heating system)	460.6369	346.1403	268.7565	115.1476	26.5557	0.0000	0.0000	0.0000	0.0000	127.9458	308.5429	476.2320	(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	241.7058	213.3774	225.6259	195.7273	187.9537	167.4149	163.7626	171.3238	174.3823	196.7882	212.1177	238.7099	(64)
Efficiency of water heater (217)m	88.3227	88.3149	88.2996	88.2657	88.2210	88.2000	88.2000	88.2000	88.2000	88.2702	88.3095	88.3248	(216)
Fuel for water heating, kWh/month	273.6623	241.6097	255.5233	221.7477	213.0486	189.8128	185.6718	194.2446	197.7123	222.9384	240.1980	270.2637	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.6512	18.1716	16.3615	11.9871	9.2592	7.5649	8.4466	10.9792	14.2608	18.7110	21.1340	23.2807	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2129.9577	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												88.2000	
Water heating fuel used												2706.4333	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												182.8078	(232)

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

PV generation													0.0000 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													5105.1989 (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	2129.9577	0.2100	447.2911 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2706.4333	0.2100	568.3510 (264)
Space and water heating			1015.6421 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	182.8078	0.1443	26.3848 (268)
Total CO2, kg/year			1053.9562 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.7000 (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	2129.9577	1.1300	2406.8522 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2706.4333	1.1300	3058.2697 (278)
Space and water heating			5465.1219 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	182.8078	1.5338	280.3967 (282)
Total Primary energy kWh/year			5875.6194 (286)
Dwelling Primary energy Rate (DPER)			87.5500 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	67.1100 (1b)	x 2.5000 (2b)	= 167.7750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.1100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 167.7750 (5)

2. Ventilation rate

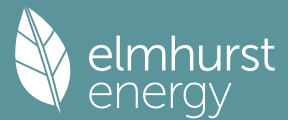
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1192 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3692 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3138 (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	0.4001	0.3923	0.3844	0.3452	0.3374	0.2981	0.2981	0.2903	0.3138	0.3374	0.3531	0.3687 (22b)
Effective ac	0.5801	0.5769	0.5739	0.5596	0.5569	0.5444	0.5444	0.5421	0.5492	0.5569	0.5623	0.5680 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			10.5600	1.1450	12.0916		(27)
Heatloss Floor			67.1100	0.1300	8.7243		(28a)
External Wall	67.1100	10.5600	56.5500	0.1800	10.1790		(29a)
Total net area of external elements Aum(A, m2)			134.2200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9949		(33)
Party Wall			42.4500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							337.9772 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				5.7500	0.0500	0.2875	
E3 Sill				4.8000	0.0500	0.2400	

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E4 Jamb	21.8000	0.0500	1.0900	
E5 Ground floor (normal)	16.9900	0.1600	2.7184	
E7 Party floor between dwellings (in blocks of flats)	16.9900	0.0700	1.1893	
E16 Corner (normal)	2.5000	0.0900	0.2250	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
P1 Party wall - Ground floor	16.9900	0.0800	1.3592	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.9900	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.4094 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		38.4043 (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	32.1150	31.9429	31.7742	30.9818	30.8336	30.1435	30.1435	30.0157	30.4093	30.8336	31.1335	31.4470	(38)
Average = Sum(39)m / 12 =	70.5193	70.3472	70.1785	69.3861	69.2379	68.5478	68.5478	68.4200	68.8136	69.2379	69.5378	69.8513	(39)
												69.3854	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0508	1.0482	1.0457	1.0339	1.0317	1.0214	1.0214	1.0195	1.0254	1.0317	1.0362	1.0408	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1740 (42)
Hot water usage for mixer showers	60.6700	59.7582	58.4296	55.8876	54.0116	51.9196	50.7304	52.0490	53.4944	55.7406	58.3372	60.4375	(42a)
Hot water usage for baths	26.2133	25.8240	25.2758	24.2649	23.5081	22.6688	22.2154	22.7598	23.3526	24.2506	25.2823	26.1247	(42b)
Hot water usage for other uses	36.8936	35.5520	34.2105	32.8689	31.5273	30.1857	30.1857	31.5273	32.8689	34.2105	35.5520	36.8936	(42c)
Average daily hot water use (litres/day)													113.7792 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	123.7769	121.1343	117.9158	113.0214	109.0470	104.7740	103.1316	106.3361	109.7158	114.2017	119.1715	123.4558	(44)
Energy content (annual)	196.0324	172.4936	181.2323	154.7206	146.7982	128.8319	124.7287	131.6663	135.2906	154.9706	169.7817	193.3020	(45)
Distribution loss (46)m = 0.15 x (45)m	29.4049	25.8740	27.1848	23.2081	22.0197	19.3248	18.7093	19.7499	20.2936	23.2456	25.4673	28.9953	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	246.9913	218.5210	232.1912	204.0357	197.7571	178.1470	175.6876	182.6252	184.6056	205.9295	219.0968	244.2609	(62)
WWHRS	-27.7358	-24.5297	-25.6861	-21.2691	-19.8221	-16.9619	-15.8991	-16.9071	-17.5494	-20.6888	-23.4379	-27.2222	(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	219.2555	193.9912	206.5050	182.7666	177.9350	161.1851	159.7886	165.7182	167.0562	185.2407	195.6588	217.0387	(64)
12Total per year (kWh/year)													2232.1396 (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	77.9205	68.8610	72.9995	63.7734	61.5501	55.1654	54.2120	56.5188	57.3129	64.2674	68.7812	77.0126	(65)

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

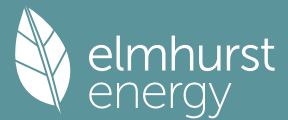
Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	100.5565	111.3304	100.5565	103.9084	100.5565	103.9084	100.5565	100.5565	103.9084	100.5565	103.9084	100.5565	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	190.4603	192.4366	187.4562	176.8535	163.4695	150.8904	142.4868	140.5104	145.4908	156.0935	169.4775	182.0566	(68)
Pumps, fans	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	(71)
Total internal gains	104.7318	102.4717	98.1175	88.5741	82.7287	76.6186	72.8656	75.9661	79.6012	86.3810	95.5294	103.5116	(72)
	454.3581	464.8483	444.7398	427.9456	405.3642	387.0269	371.5184	372.6425	384.6100	401.6405	427.5249	444.7343	(73)

6. Solar gains

[Jan]												Gains
				Area	Solar flux		g		FF	Access		W
				m2	Table 6a		Specific data		Specific data	factor		
					W/m2		or Table 6b		or Table 6c	Table 6d		
North				3.5200	10.6334		0.6300		0.7000	0.7700		11.4390 (74)
West				7.0400	19.6403		0.6300		0.7000	0.7700		42.2563 (80)
Solar gains	53.6953	104.5228	173.2793	258.2084	323.6967	335.1270	317.4702	267.4313	202.9902	124.1078	66.8001	44.2856 (83)
Total gains	508.0534	569.3710	618.0191	686.1539	729.0609	722.1538	688.9886	640.0738	587.6002	525.7484	494.3250	489.0199 (84)

7. Mean internal temperature (heating season)

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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	89.3438	89.5623	89.7776	90.8029	90.9973	91.9134	91.9134	92.0851	91.5584	90.9973	90.6048	90.1981	
alpha	6.9563	6.9708	6.9852	7.0535	7.0665	7.1276	7.1276	7.1390	7.1039	7.0665	7.0403	7.0132	
util living area	0.9984	0.9959	0.9877	0.9452	0.8154	0.6005	0.4371	0.4901	0.7665	0.9683	0.9956	0.9987 (86)	
MIT	20.1501	20.2828	20.4835	20.7573	20.9372	20.9936	20.9994	20.9987	20.9690	20.7318	20.3974	20.1303 (87)	
Th 2	20.0412	20.0433	20.0454	20.0552	20.0570	20.0655	20.0655	20.0671	20.0622	20.0570	20.0533	20.0494 (88)	
util rest of house	0.9976	0.9941	0.9821	0.9219	0.7558	0.5165	0.3447	0.3917	0.6809	0.9496	0.9933	0.9982 (89)	
MIT 2	19.0601	19.2309	19.4861	19.8245	20.0120	20.0628	20.0654	20.0668	20.0456	19.8033	19.3855	19.0412 (90)	
Living area fraction									fLA = Living area / (4) =				0.3459 (91)
MIT	19.4371	19.5947	19.8310	20.1471	20.3320	20.3847	20.3884	20.3891	20.3649	20.1244	19.7354	19.4179 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.4371	19.5947	19.8310	20.1471	20.3320	20.3847	20.3884	20.3891	20.3649	20.1244	19.7354	19.4179 (93)	

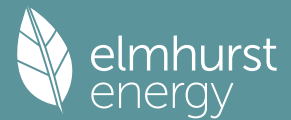
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9970	0.9929	0.9805	0.9245	0.7743	0.5456	0.3767	0.4259	0.7101	0.9513	0.9923	0.9977 (94)
Useful gains	506.5276	565.3339	605.9945	634.3512	564.5473	394.0161	259.5331	272.5768	417.2637	500.1343	490.5187	487.8779 (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	1067.4549	1033.7301	935.5523	780.3920	597.6589	396.5280	259.6875	272.9336	431.1122	659.4523	878.6399	1062.9879 (97)
Space heating kWh	417.3299	314.7622	245.1910	105.1494	24.6350	0.0000	0.0000	0.0000	0.0000	118.5326	279.4473	427.8818 (98a)
Space heating requirement - total per year (kWh/year)												1932.9292
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	417.3299	314.7622	245.1910	105.1494	24.6350	0.0000	0.0000	0.0000	0.0000	118.5326	279.4473	427.8818 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1932.9292
Space heating per m2										(98c) / (4) =		28.8024 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	417.3299	314.7622	245.1910	105.1494	24.6350	0.0000	0.0000	0.0000	0.0000	118.5326	279.4473	427.8818 (98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)	
Space heating fuel (main heating system)	451.6557	340.6518	265.3582	113.7980	26.6613	0.0000	0.0000	0.0000	0.0000	128.2820	302.4321	463.0756 (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	219.2555	193.9912	206.5050	182.7666	177.9350	161.1851	159.7886	165.7182	167.0562	185.2407	195.6588	217.0387 (64)	
Efficiency of water heater (217)m	85.7374	85.4120	84.7504	83.2409	81.2559	80.3000	80.3000	80.3000	80.3000	83.4500	85.1447	85.8073 (217)	
Fuel for water heating, kWh/month	255.7292	227.1241	243.6627	219.5635	218.9809	200.7286	198.9895	206.3738	208.0401	221.9780	229.7958	252.9374 (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	20.8937	16.7617	15.0920	11.0571	8.5408	6.9779	7.7912	10.1273	13.1543	17.2592	19.4942	21.4744 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.0223	-26.7218	-40.3726	-47.7910	-53.6459	-50.8531	-50.2417	-46.3870	-39.9493	-31.6103	-20.2778	-15.4325 (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	-6.5432	-14.0651	-28.5224	-43.6804	-58.5846	-59.1626	-58.4579	-49.1069	-35.4921	-20.3777	-8.8204	-5.1515 (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													2091.9147 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													2683.9036 (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)													168.6237 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-829.2700 (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)

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Energy used	0.0000 (237)
Total delivered energy for all uses	4201.1721 (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	2091.9147	0.2100	439.3021 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2683.9036	0.2100	563.6198 (264)
Space and water heating			1002.9218 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	168.6237	0.1443	24.3376 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-441.3053	0.1335	-58.9303
PV Unit electricity exported	-387.9647	0.1253	-48.6248
Total			-107.5551 (269)
Total CO2, kg/year			931.6336 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.8800 (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	2091.9147	1.1300	2363.8636 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2683.9036	1.1300	3032.8111 (278)
Space and water heating			5396.6747 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	168.6237	1.5338	258.6407 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-441.3053	1.4935	-659.0754
PV Unit electricity exported	-387.9647	0.4600	-178.4761
Total			-837.5515 (283)
Total Primary energy kWh/year			4947.8647 (286)
Target Primary Energy Rate (TPER)			73.7300 (287)

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Property Reference	Be Lean			Issued on Date	06/01/2025
Assessment Reference	TF-Unit 19 (Block B)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	86 B	DER	12.98	TER	11.92
Environmental	90 B	% DER < TER			-8.89
CO ₂ Emissions (t/year)	0.78	DFEE	19.36	TFEE	23.99
Compliance Check	See BREL	% DFEE < TFEE			19.30
% DPER < TPER	-15.29	DPER	72.85	TPER	63.19
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.8700 (1b)	x 2.4000 (2b)	= 150.8880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 150.8880 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1325 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2825 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2402 (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 infiltr rate	0.3062	0.3002	0.2942	0.2642	0.2582	0.2282	0.2282	0.2222	0.2402	0.2582	0.2702	0.2822 (22b)
Effective ac	0.5469	0.5451	0.5433	0.5349	0.5333	0.5260	0.5260	0.5247	0.5288	0.5333	0.5365	0.5398 (25)

3. Heat losses and heat loss parameter

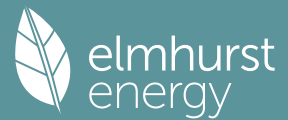
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.00)			11.4800	0.9615	11.0385		(27)
External Wall	23.8300	11.4800	12.3500	0.1300	1.6055	70.0000	864.5000 (29a)
External Roof	62.8700		62.8700	0.1000	6.2870	9.0000	565.8300 (30)
Total net area of external elements A _{um} (A, m ²)			86.7000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	18.9310			(33)
Party Wall			54.2200	0.0000	0.0000	180.0000	9759.6000 (32)
Party Floor			62.8700			40.0000	2514.8000 (32d)
Internal Wall			125.1400			9.0000	1126.2600 (32c)

Heat capacity C_m = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14830.9900 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 235.8993 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.1500	0.3000	1.8450
E3 Sill	5.2000	0.0400	0.2080
E4 Jamb	17.4000	0.0500	0.8700
E7 Party floor between dwellings (in blocks of flats)	9.9300	0.0700	0.6951
E18 Party wall between dwellings	4.8000	0.0600	0.2880
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	22.5900	0.0000	0.0000
E15 Flat roof with parapet	9.9300	0.2800	2.7804

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P4 Party wall - Roof (insulation at ceiling level) 22.5900 0.1200 2.7108
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.3973 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 28.3283 (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 27.2310 27.1403 27.0515 26.6341 26.5560 26.1925 26.1925 26.1252 26.3325 26.5560 26.7140 26.8791 (38)
 Average = Sum(39)m / 12 = 55.5592 55.4686 55.3797 54.9624 54.8843 54.5208 54.5208 54.4535 54.6608 54.8843 55.0423 55.2074 (39)
 54.9620

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 HLP (average) 0.8837 0.8823 0.8809 0.8742 0.8730 0.8672 0.8672 0.8661 0.8694 0.8730 0.8755 0.8781 (40)
 Days in mont 31 28 31 30 31 30 31 31 30 31 30 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0615 (42)
 Hot water usage for mixer showers 66.1324 65.1385 63.6903 60.9194 58.8745 56.5941 55.2979 56.7352 58.3107 60.7592 63.5896 65.8790 (42a)
 Hot water usage for baths 26.7394 26.3423 25.7830 24.7519 23.9798 23.1237 22.6613 23.2166 23.8212 24.7373 25.7897 26.6490 (42b)
 Hot water usage for other uses 37.6231 36.2550 34.8868 33.5187 32.1506 30.7825 30.7825 32.1506 33.5187 34.8868 36.2550 37.6231 (42c)
 Average daily hot water use (litres/day) 119.9662 (43)
 Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 Energy conte 130.4948 127.7357 124.3602 119.1901 115.0050 110.5004 108.7417 112.1024 115.6507 120.3833 125.6342 130.1510 (44)
 Energy content (annual) 163.3590 178.9890 203.7851 (45)
 Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1992.6218
 31.0008 27.2841 28.6705 24.4748 23.2228 20.3810 19.7271 20.8209 21.3913 24.5039 26.8483 30.5678 (46)
 Water storage loss:
 Total storage loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)
 If cylinder contains dedicated solar storage 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)
 Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)
 Combi loss 28.4006 25.6439 28.3507 27.3194 28.1583 27.1723 28.0187 28.0542 27.1894 28.1807 27.3812 28.3840 (61)
 Total heat required for water heating calculated for each month
 WWHRs 235.0725 207.5379 219.4877 190.4846 182.9772 163.0454 159.5324 166.8604 169.7983 191.5397 206.3702 232.1690 (62)
 PV diverter 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)
 Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63b)
 FGHRs 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)
 Output from w/h 235.0725 207.5379 219.4877 190.4846 182.9772 163.0454 159.5324 166.8604 169.7983 191.5397 206.3702 232.1690 (64)
 12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2324.8753 (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 75.8186 66.8907 70.6407 61.0823 58.5168 51.9709 50.7330 53.1666 54.2148 61.3621 66.3591 74.8545 (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 94.8097 104.9679 94.8097 97.9701 94.8097 97.9701 94.8097 97.9701 94.8097 97.9701 94.8097 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 180.1228 181.9919 177.2818 167.2546 154.5970 142.7006 134.7531 132.8840 137.5941 147.6213 160.2789 172.1753 (68)
 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 (69)
 Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 0.0000 0.0000 0.0000 0.0000 3.0000 3.0000 3.0000 (70)
 Losses e.g. evaporation (negative values) (Table 5) -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 (71)
 Water heating gains (Table 5) 101.9067 99.5398 94.9472 84.8365 78.6517 72.1818 68.1895 71.4605 75.2983 82.4759 92.1655 100.6109 (72)
 Total internal gains 433.7618 443.4222 423.9614 406.9838 384.9810 366.7751 351.6750 353.0769 364.7851 381.8296 407.3371 424.5186 (73)

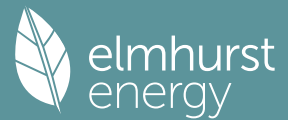
6. Solar gains

[Jan] Area Solar flux g Specific data FF Access Gains
 m2 Table 6a W/m2 or Table 6b Specific data or Table 6c factor Table 6d W
 South 11.4800 46.7521 0.5700 0.7000 0.7700 148.4051 (78)
 Solar gains 148.4051 243.0493 309.6017 349.9171 364.6353 350.9119 342.8622 332.9667 323.4155 262.1515 175.9106 128.2357 (83)
 Total gains 582.1669 686.4715 733.5631 756.9009 749.6163 717.6870 694.5372 686.0436 688.2007 643.9811 583.2477 552.7542 (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 74.1501 74.2712 74.3904 74.9553 75.0619 75.5623 75.5623 75.6558 75.3688 75.0619 74.8465 74.6226
 alpha 5.9433 5.9514 5.9594 5.9970 6.0041 6.0375 6.0375 6.0437 6.0246 6.0041 5.9898 5.9748
 util living area 0.9757 0.9424 0.8920 0.7962 0.6577 0.4830 0.3450 0.3646 0.5413 0.8008 0.9450 0.9811 (86)

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MIT	20.3235	20.5372	20.7203	20.8825	20.9672	20.9956	20.9995	20.9993	20.9913	20.8962	20.5971	20.2751 (87)
Th 2	20.1814	20.1826	20.1838	20.1895	20.1905	20.1955	20.1955	20.1964	20.1936	20.1905	20.1884	20.1861 (88)
util rest of house	0.9696	0.9296	0.8698	0.7600	0.6076	0.4237	0.2821	0.3012	0.4808	0.7586	0.9304	0.9763 (89)
MIT 2	19.5837	19.7884	19.9586	20.1043	20.1707	20.1936	20.1953	20.1962	20.1894	20.1192	19.8536	19.5407 (90)
Living area fraction									fLA = Living area / (4) =			0.4129 (91)
MIT	19.8892	20.0976	20.2731	20.4256	20.4996	20.5248	20.5274	20.5278	20.5205	20.4400	20.1606	19.8439 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8892	20.0976	20.2731	20.4256	20.4996	20.5248	20.5274	20.5278	20.5205	20.4400	20.1606	19.8439 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9670	0.9281	0.8725	0.7710	0.6271	0.4481	0.3081	0.3274	0.5056	0.7722	0.9298	0.9738 (94)
Useful gains	562.9472	637.0859	640.0078	583.6034	470.1033	321.5839	214.0032	224.5959	347.9506	497.3008	542.2989	538.2802 (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	866.1222	842.9893	762.7523	633.4756	482.9596	323.0223	214.1249	224.7740	350.9521	540.0620	718.8846	863.6611 (97)
Space heating kWh	225.5622	138.3671	91.3219	35.9080	9.5651	0.0000	0.0000	0.0000	0.0000	31.8143	127.1418	242.0834 (98a)
Space heating requirement - total per year (kWh/year)												901.7638
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	225.5622	138.3671	91.3219	35.9080	9.5651	0.0000	0.0000	0.0000	0.0000	31.8143	127.1418	242.0834 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												901.7638
Space heating per m2										(98c) / (4) =		14.3433 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												83.4000 (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
	225.5622	138.3671	91.3219	35.9080	9.5651	0.0000	0.0000	0.0000	0.0000	31.8143	127.1418	242.0834 (98)
Space heating efficiency (main heating system 1)	83.4000	83.4000	83.4000	83.4000	83.4000	0.0000	0.0000	0.0000	0.0000	83.4000	83.4000	83.4000 (210)
Space heating fuel (main heating system)	270.4583	165.9078	109.4987	43.0552	11.4689	0.0000	0.0000	0.0000	0.0000	38.1467	152.4482	290.2678 (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	235.0725	207.5379	219.4877	190.4846	182.9772	163.0454	159.5324	166.8604	169.7983	191.5397	206.3702	232.1690 (64)
Efficiency of water heater (217)m	88.2978	88.2799	88.2587	88.2317	88.2099	88.2000	88.2000	88.2000	88.2000	88.2284	88.2761	88.2000 (216)
Fuel for water heating, kWh/month	266.2269	235.0908	248.6869	215.8914	207.4338	184.8588	180.8757	189.1842	192.5150	217.0952	233.7780	262.9262 (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	20.2829	16.2717	14.6509	10.7339	8.2911	6.7739	7.5635	9.8313	12.7699	16.7547	18.9244	20.8467 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1081.2516 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												88.2000
Water heating fuel used												2634.5628 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												163.6950 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												3965.5094 (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	1081.2516	0.2100	227.0628 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2634.5628	0.2100	553.2582 (264)
Space and water heating			780.3210 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	163.6950	0.1443	23.6262 (268)
Total CO2, kg/year			815.8765 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.9800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1081.2516	1.1300	1221.8143 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2634.5628	1.1300	2977.0560 (278)
Space and water heating			4198.8703 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	163.6950	1.5338	251.0808 (282)
Total Primary energy kWh/year			4580.0519 (286)
Dwelling Primary energy Rate (DPER)			72.8500 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.8700 (1b)	x 2.4000 (2b)	= 150.8880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 150.8880 (5)

2. Ventilation rate

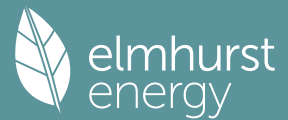
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1325 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3825 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3252 (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	0.4146	0.4065	0.3983	0.3577	0.3496	0.3089	0.3089	0.3008	0.3252	0.3496	0.3658	0.3821 (22b)
Effective ac	0.5859	0.5826	0.5793	0.5640	0.5611	0.5477	0.5477	0.5452	0.5529	0.5611	0.5669	0.5730 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (Uw = 1.20)			11.4800	1.1450	13.1450		(27)
External Wall	23.8300	11.4800	12.3500	0.1800	2.2230		(29a)
External Roof	62.8700		62.8700	0.1100	6.9157		(30)
Total net area of external elements Aum (A, m ²)			86.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.2837		(33)
Party Wall			54.2200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							235.8993 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				6.1500	0.0500	0.3075	
E3 Sill				5.2000	0.0500	0.2600	
E4 Jamb				17.4000	0.0500	0.8700	
E7 Party floor between dwellings (in blocks of flats)				9.9300	0.0700	0.6951	

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E18 Party wall between dwellings	4.8000	0.0600	0.2880									
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	22.5900	0.0000	0.0000									
E15 Flat roof with parapet	9.9300	0.5600	5.5608									
P4 Party wall - Roof (insulation at ceiling level)	22.5900	0.1200	2.7108									
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												
Point Thermal bridges			(36a) =	10.6922 (36)								
Total fabric heat loss			(33) + (36) + (36a) =	32.9759 (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	29.1758	29.0096	28.8467	28.0817	27.9386	27.2722	27.2722	27.1489	27.5289	27.9386	28.2281	28.5309 (38)
Average = Sum(39)m / 12 =	62.1517	61.9856	61.8227	61.0576	60.9145	60.2482	60.2482	60.1248	60.5048	60.9145	61.2041	61.5068 (39)
												61.0570
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9886	0.9859	0.9833	0.9712	0.9689	0.9583	0.9583	0.9563	0.9624	0.9689	0.9735	0.9783 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0615 (42)
Hot water usage for mixer showers												58.5591 (42a)
Hot water usage for baths												25.3165 (42b)
Hot water usage for other uses												35.7419 (42c)
Average daily hot water use (litres/day)												110.2419 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	119.9286	117.3683	114.2500	109.5077	105.6569	101.5168	99.9253	103.0302	106.3047	110.6511	115.4665	119.6175 (44)
Energy conte	189.9377	167.1308	175.5980	149.9106	142.2344	124.8268	120.8510	127.5729	131.0843	150.1525	164.5032	187.2922 (45)
Energy content (annual)										Total = Sum(45)m =		1831.0943
Distribution loss (46)m = 0.15 x (45)m												28.0938 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9209	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
WWHRS	240.8966	213.1582	226.5569	199.2256	193.1933	174.1418	171.7719	178.5318	180.3994	201.1114	213.8182	238.2511 (62)
PV diverter	-26.8737	-23.7674	-24.8878	-20.6081	-19.2060	-16.4347	-15.4049	-16.3816	-17.0040	-20.0458	-22.7095	-26.3761 (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	214.0228	189.3909	201.6691	178.6176	173.9874	157.7071	156.3670	162.1502	163.3954	181.0656	191.1087	211.8750 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2181.3567 (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	75.8940	67.0779	71.1261	62.1740	60.0327	53.8337	52.9132	55.1577	55.9143	62.6654	67.0261	75.0144 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	92.5834	102.5031	92.5834	95.6695	92.5834	95.6695	92.5834	92.5834	95.6695	92.5834	95.6695	92.5834 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	180.1228	181.9919	177.2818	167.2546	154.5970	142.7006	134.7531	132.8840	137.5941	147.6213	160.2789	172.1753 (68)
Pumps, fans	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604 (71)
Total internal gains	102.0081	99.8182	95.5995	86.3528	80.6891	74.7690	71.1199	74.1367	77.6588	84.2277	93.0918	100.8258 (72)
	431.6369	441.2358	422.3874	406.1995	384.7921	367.0617	352.3790	353.5267	364.8450	381.3551	405.9629	422.5071 (73)

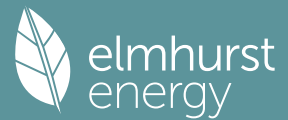
6. Solar gains

[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
South	11.4800											164.0267 (78)
Solar gains	164.0267	268.6334	342.1914	386.7505	403.0180	387.8500	378.9530	368.0159	357.4593	289.7464	194.4276	141.7342 (83)
Total gains	595.6636	709.8693	764.5787	792.9500	787.8101	754.9117	731.3320	721.5426	722.3043	671.1015	600.3904	564.2413 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	66.2849	66.4626	66.6377	67.4726	67.6312	68.3791	68.3791	68.5195	68.0891	67.6312	67.3112	66.9799

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alpha	5.4190	5.4308	5.4425	5.4982	5.5087	5.5586	5.5586	5.5680	5.5393	5.5087	5.4874	5.4653
util living area	0.9784	0.9489	0.9035	0.8147	0.6819	0.5047	0.3617	0.3822	0.5659	0.8210	0.9515	0.9830 (86)
MIT	20.1619	20.4024	20.6210	20.8285	20.9458	20.9916	20.9989	20.9985	20.9839	20.8474	20.4839	20.1169 (87)
Th 2	20.0929	20.0951	20.0972	20.1074	20.1093	20.1182	20.1182	20.1199	20.1148	20.1093	20.1055	20.1014 (88)
util rest of house	0.9726	0.9367	0.8819	0.7776	0.6276	0.4378	0.2896	0.3097	0.4982	0.7779	0.9377	0.9785 (89)
MIT 2	19.1426	19.4404	19.7038	19.9470	20.0671	20.1136	20.1179	20.1193	20.1051	19.9737	19.5533	19.0930 (90)
Living area fraction	19.5635	19.8376	20.0825	20.3110	20.4299	20.4761	20.4817	20.4824	20.4680	20.3345	19.9376	19.5158 (92)
MIT												0.4129 (91)
Temperature adjustment												0.0000
adjusted MIT	19.5635	19.8376	20.0825	20.3110	20.4299	20.4761	20.4817	20.4824	20.4680	20.3345	19.9376	19.5158 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9685	0.9327	0.8815	0.7866	0.6477	0.4652	0.3194	0.3396	0.5256	0.7895	0.9347	0.9747 (94)
Useful gains	576.9173	662.0898	673.9685	623.7132	510.2856	351.2116	233.5810	245.0503	379.6678	529.8643	561.1848	549.9795 (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	948.6530	925.9172	839.7073	696.7280	531.7801	354.0247	233.8625	245.4505	385.2921	592.9699	785.7114	942.0235 (97)
Space heating kWh	276.5714	177.2920	123.3096	52.5706	15.9919	0.0000	0.0000	0.0000	0.0000	46.9506	161.6591	291.6807 (98a)
Space heating requirement - total per year (kWh/year)												1146.0260
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	276.5714	177.2920	123.3096	52.5706	15.9919	0.0000	0.0000	0.0000	0.0000	46.9506	161.6591	291.6807 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1146.0260
Space heating per m2										(98c) / (4) =		18.2285 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	276.5714	177.2920	123.3096	52.5706	15.9919	0.0000	0.0000	0.0000	0.0000	46.9506	161.6591	291.6807 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	299.3197	191.8745	133.4520	56.8946	17.3073	0.0000	0.0000	0.0000	0.0000	50.8123	174.9557	315.6718 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	214.0228	189.3909	201.6691	178.6176	173.9874	157.7071	156.3670	162.1502	163.3954	181.0656	191.1087	211.8750 (64)
Efficiency of water heater (217)m	84.9318	84.2402	83.3598	82.1061	80.9593	80.3000	80.3000	80.3000	80.3000	81.9320	84.0249	85.0667 (217)
Fuel for water heating, kWh/month	251.9937	224.8226	241.9260	217.5447	214.9073	196.3974	194.7285	201.9305	203.4812	220.9949	227.4430	249.0693 (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	19.2370	15.4326	13.8954	10.1804	7.8636	6.4246	7.1734	9.3243	12.1113	15.8907	17.9486	19.7717 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-16.9147	-25.0975	-37.9488	-44.9632	-50.5133	-47.9039	-47.3303	-43.6781	-37.5856	-29.7070	-19.0384	-14.4822 (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	-6.0989	-13.1124	-26.5934	-40.7291	-54.6265	-55.1610	-54.5016	-45.7824	-33.0895	-18.9964	-8.2214	-4.8013 (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												1240.2878 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2645.2390 (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)												155.2536 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-776.8768 (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												3349.9037 (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	1240.2878	0.2100	260.4604 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2645.2390	0.2100	555.5002 (264)
Space and water heating			815.9606 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	155.2536	0.1443	22.4079 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.1630	0.1335	-55.4314
PV Unit electricity exported	-361.7139	0.1253	-45.3345
Total			-100.7660 (269)
Total CO2, kg/year			749.5318 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9200 (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	1240.2878	1.1300	1401.5252 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2645.2390	1.1300	2989.1201 (278)
Space and water heating			4390.6453 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	155.2536	1.5338	238.1332 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.1630	1.4934	-620.0028
PV Unit electricity exported	-361.7139	0.4600	-166.3994
Total			-786.4022 (283)
Total Primary energy kWh/year			3972.4772 (286)
Target Primary Energy Rate (TPER)			63.1900 (287)

iii. Be Green

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Property Reference	Be Green			Issued on Date	06/01/2025
Assessment Reference	FF-Unit 5 (Block A)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	88 B	DER	3.32	TER	10.50
Environmental	98 A	% DER < TER			68.38
CO ₂ Emissions (t/year)	0.19	DFEE	16.18	TFEE	19.03
Compliance Check	See BREL	% DFEE < TFEE			15.02
% DPER < TPER	36.56	DPER	35.26	TPER	55.58
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	60.4500 (1b)	2.4000 (2b)	145.0800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.4500		145.0800 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	145.0800 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1379 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2879 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2447 (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	0.3120	0.3058	0.2997	0.2691	0.2630	0.2324	0.2324	0.2263	0.2447	0.2630	0.2753	0.2875 (22b)
Effective ac	0.5487	0.5468	0.5449	0.5362	0.5346	0.5270	0.5270	0.5256	0.5299	0.5346	0.5379	0.5413 (25)

3. Heat losses and heat loss parameter

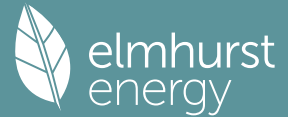
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.00)			11.1100	0.9615	10.6827		(27)
External Wall	38.1400	11.1100	27.0300	0.1300	3.5139	70.0000	1892.1000 (29a)
Total net area of external elements A _{um} (A, m ²)			38.1400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	14.1966		(33)
Party Wall			38.1400	0.0000	0.0000	180.0000	6865.2000 (32)
Party Floor			60.4500			40.0000	2418.0000 (32d)
Party Ceiling			60.4500			30.0000	1813.5000 (32b)
Internal Wall			98.7800			9.0000	889.0200 (32c)

Heat capacity C_m = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13877.8200 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 229.5752 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.0000	0.3000	1.8000
E3 Sill	3.2000	0.0400	0.1280
E4 Jamb	21.8000	0.0500	1.0900
E7 Party floor between dwellings (in blocks of flats)	27.7900	0.0700	1.9453
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	31.7800	0.0000	0.0000
E18 Party wall between dwellings	4.8000	0.0600	0.2880
E9 Balcony between dwellings, wall insulation continuous	3.0000	0.0200	0.0600

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E16 Corner (normal)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Point Thermal bridges
Total fabric heat loss

2.4000
0.0900
0.2160
5.5273 (36)
0.0000
(33) + (36) + (36a) = 19.7239 (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	26.2679	26.1774	26.0887	25.6723	25.5943	25.2316	25.2316	25.1644	25.3713	25.5943	25.7520	25.9168
Average = Sum(39)m / 12 =	45.9918	45.9013	45.8126	45.3961	45.3182	44.9555	44.9555	44.8883	45.0952	45.3182	45.4759	45.6407
HLP	0.7608	0.7593	0.7579	0.7510	0.7497	0.7437	0.7437	0.7426	0.7460	0.7497	0.7523	0.7550
HLP (average)												0.7510
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9943 (42)
Hot water usage for mixer showers												
Hot water usage for baths	64.8652	63.8904	62.4699	59.7521	57.7464	55.5097	54.2383	55.6480	57.1934	59.5949	62.3711	64.6166
Hot water usage for other uses	24.9180	24.5479	24.0268	23.0659	22.3464	21.5486	21.1177	21.6352	22.1987	23.0523	24.0330	24.8338
Distribution loss (46)m = 0.15 x (45)m	35.0539	33.7792	32.5045	31.2299	29.9552	28.6805	28.6805	29.9552	31.2299	32.5045	33.7792	35.0539
Average daily hot water use (litres/day)												114.7736
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	124.8371	122.2175	119.0012	114.0479	110.0480	105.7388	104.0365	107.2384	110.6219	115.1518	120.1833	124.5043
Energy content (annual)	197.7114	174.0361	182.9005	156.1258	148.1458	130.0182	125.8232	132.7836	136.4078	156.2599	171.2232	194.9437
Distribution loss (46)m = 0.15 x (45)m	29.6567	26.1054	27.4351	23.4189	22.2219	19.5027	18.8735	19.9175	20.4612	23.4390	25.6835	29.2416
Water storage loss:												150.0000
Store volume												1.2960
a) If manufacturer declared loss factor is known (kWh/day):												0.5400
Temperature factor from Table 2b												0.6998
Enter (49) or (54) in (55)												
Total storage loss	21.6950	19.5955	21.6950	20.9952	21.6950	20.9952	21.6950	21.6950	20.9952	21.6950	20.9952	21.6950
If cylinder contains dedicated solar storage	21.6950	19.5955	21.6950	20.9952	21.6950	20.9952	21.6950	21.6950	20.9952	21.6950	20.9952	21.6950
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
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
Total heat required for water heating calculated for each month	242.6689	214.6429	227.8579	199.6330	193.1032	173.5254	170.7806	177.7410	179.9150	201.2173	214.7304	239.9011
WWHRS	-29.0008	-25.6485	-26.8577	-22.2392	-20.7262	-17.7355	-16.6242	-17.6782	-18.3499	-21.6325	-24.5069	-28.4638
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
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
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
Output from w/h	213.6681	188.9943	201.0002	177.3938	172.3771	155.7899	154.1564	160.0628	161.5652	179.5849	190.2234	211.4374
12Total per year (kWh/year)												2166.2534
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
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a) m =												2166
Heat gains from water heating, kWh/month	101.7050	90.3524	96.7804	86.7176	85.2244	78.0368	77.8022	80.1165	80.1614	87.9224	91.7375	100.7847

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	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	91.5122	101.3171	91.5122	94.5626	91.5122	94.5626	91.5122	91.5122	94.5626	91.5122	94.5626	91.5122
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	174.0804	175.8868	171.3347	161.6438	149.4109	137.9136	130.2327	128.4263	132.9784	142.6693	154.9022	166.3995
Pumps, fans	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water heating gains (Table 5)	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732
Total internal gains	136.7003	134.4530	130.0811	120.4411	114.5490	108.3845	104.5728	107.6834	111.3352	118.1752	127.4132	135.4633
	455.2078	464.5718	445.8430	429.5625	408.3870	393.7756	379.2326	380.5369	391.7912	405.2716	429.7930	446.2900

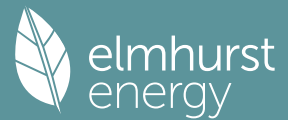
6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
East	7.0400	19.6403	0.5700	0.7000	0.7700	38.2319
South	4.0700	46.7521	0.5700	0.7000	0.7700	52.6140
Solar gains	90.8459	160.9579	232.9310	303.6893	349.4213	349.7686
Total gains	546.0538	625.5297	678.7740	733.2518	757.8083	743.5442

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)
Utilisation factor for gains for living area, nil,m (see Table 9a)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	83.8182	83.9834	84.1460	84.9180	85.0640	85.7504	85.7504	85.8787	85.4847	85.0640	84.7691	84.4631
alpha	6.5879	6.5989	6.6097	6.6612	6.6709	6.7167	6.7167	6.7252	6.6990	6.6709	6.6513	6.6309
util living area	0.9670	0.9288	0.8590	0.7183	0.5512	0.3865	0.2765	0.3023	0.4771	0.7580	0.9271	0.9734 (86)
Living	20.5836	20.7098	20.8280	20.9185	20.9476	20.9533	20.9537	20.9537	20.9518	20.9127	20.7504	20.5565
Non living	19.8097	19.9635	20.1019	20.2045	20.2329	20.2428	20.2430	20.2441	20.2397	20.2018	20.0203	19.7808
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	20.2870	20.7098	20.8280	20.9185	20.9476	20.9533	20.9537	20.9537	20.9518	20.9127	20.7504	20.6185 (87)
Th 2	20.2874	20.2887	20.2900	20.2960	20.2972	20.3024	20.3024	20.3034	20.3004	20.2972	20.2949	20.2925 (88)
util rest of house	0.9595	0.9149	0.8354	0.6837	0.5112	0.3446	0.2327	0.2566	0.4295	0.7181	0.9105	0.9672 (89)
MIT 2	20.0970	19.9635	20.1019	20.2045	20.2329	20.2428	20.2430	20.2441	20.2397	20.2018	20.0203	19.8730 (90)
Living area fraction									fLA = Living area /	(4) =		0.4395 (91)
MIT	20.4002	20.2915	20.4210	20.5183	20.5470	20.5551	20.5554	20.5560	20.5527	20.5143	20.3412	20.2007 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4002	20.2915	20.4210	20.5183	20.5470	20.5551	20.5554	20.5560	20.5527	20.5143	20.3412	20.2007 (93)

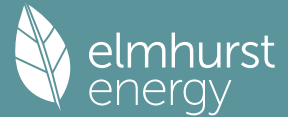
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9608	0.9149	0.8400	0.6948	0.5255	0.3598	0.2486	0.2732	0.4467	0.7308	0.9117	0.9663 (94)
Useful gains	524.6546	572.3202	570.1765	509.4991	398.2102	267.5329	177.8044	186.5326	290.2452	428.9619	492.1467	505.5539 (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	740.4788	706.4917	637.7595	527.4266	400.9323	267.7124	177.8161	186.5546	290.9863	449.2978	602.1541	730.2833 (97)
Space heating kWh	160.5732	90.1632	50.2818	12.9078	2.0252	0.0000	0.0000	0.0000	0.0000	15.1300	79.2053	167.1987 (98a)
Space heating requirement - total per year (kWh/year)												577.4852
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	160.5732	90.1632	50.2818	12.9078	2.0252	0.0000	0.0000	0.0000	0.0000	15.1300	79.2053	167.1987 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												577.4852
Space heating per m2										(98c) / (4) =		9.5531 (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 %)												233.9684 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	160.5732	90.1632	50.2818	12.9078	2.0252	0.0000	0.0000	0.0000	0.0000	15.1300	79.2053	167.1987 (98)
Space heating efficiency (main heating system 1)	233.9684	233.9684	233.9684	233.9684	233.9684	0.0000	0.0000	0.0000	0.0000	233.9684	233.9684	233.9684 (210)
Space heating fuel (main heating system)	68.6303	38.5365	21.4909	5.5169	0.8656	0.0000	0.0000	0.0000	0.0000	6.4667	33.8530	71.4621 (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	213.6681	188.9943	201.0002	177.3938	172.3771	155.7899	154.1564	160.0628	161.5652	179.5849	190.2234	211.4374 (64)
Efficiency of water heater (217)m	219.4499	219.4499	219.4499	219.4499	219.4499	219.4499	219.4499	219.4499	219.4499	219.4499	219.4499	219.4499 (216)
Fuel for water heating, kWh/month	97.3653	86.1219	91.5928	80.8357	78.5496	70.9911	70.2467	72.9382	73.6228	81.8341	86.6820	96.3488 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	19.2845	15.4707	13.9297	10.2055	7.8830	6.4405	7.1911	9.3473	12.1412	15.9299	17.9928	19.8204 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												246.8219 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												219.4499
Water heating fuel used												987.1291 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												155.6366 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)

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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	1389.5876 (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	246.8219	0.1588	39.1834 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	987.1291	0.1408	138.9825 (264)
Space and water heating			178.1659 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	155.6366	0.1443	22.4632 (268)
Total CO2, kg/year			200.6291 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3200 (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	246.8219	1.5876	391.8540 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	987.1291	1.5206	1501.0306 (278)
Space and water heating			1892.8846 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	155.6366	1.5338	238.7207 (282)
Total Primary energy kWh/year			2131.6053 (286)
Dwelling Primary energy Rate (DPER)			35.2600 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	60.4500 (1b)	x 2.4000 (2b)	= 145.0800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.4500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.0800 (5)

2. Ventilation rate

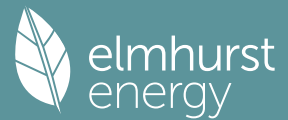
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1379 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3879 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3297 (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	0.4203	0.4121	0.4039	0.3626	0.3544	0.3132	0.3132	0.3050	0.3297	0.3544	0.3709	0.3874 (22b)
Effective ac	0.5883	0.5849	0.5815	0.5658	0.5628	0.5490	0.5490	0.5465	0.5543	0.5628	0.5688	0.5750 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			11.1100	1.1450	12.7214		(27)
External Wall	38.1400	11.1100	27.0300	0.1800	4.8654		(29a)
Total net area of external elements Aum(A, m2)			38.1400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.5868		(33)
Party Wall			38.1400	0.0000	0.0000		(32)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												239.5752 (35)
List of Thermal Bridges												
K1 Element						Length	Psi-value	Total				
E2 Other lintels (including other steel lintels)						6.0000	0.0500	0.3000				
E3 Sill						3.2000	0.0500	0.1600				
E4 Jamb						21.8000	0.0500	1.0900				
E7 Party floor between dwellings (in blocks of flats)						27.7900	0.0700	1.9453				
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)						31.7800	0.0000	0.0000				
E18 Party wall between dwellings						4.8000	0.0600	0.2880				
E9 Balcony between dwellings, wall insulation continuous						3.0000	0.0200	0.0600				
E16 Corner (normal)						2.4000	0.0900	0.2160				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												4.0593 (36)
Point Thermal bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 21.6461 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	28.1677	28.0035	27.8425	27.0863	26.9449	26.2863	26.2863	26.1643	26.5400	26.9449	27.2311	27.5303 (38)
Average = Sum(39)m / 12 =	49.8138	49.6495	49.4885	48.7324	48.5909	47.9324	47.9324	47.8104	48.1860	48.5909	48.8771	49.1763 (39)
												48.7317
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8240	0.8213	0.8187	0.8062	0.8038	0.7929	0.7929	0.7909	0.7971	0.8038	0.8086	0.8135 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												0.8061
												31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												1.9943 (42)
Hot water usage for mixer showers												
	57.6579	56.7914	55.5288	53.1130	51.3301	49.3419	48.2118	49.4649	50.8385	52.9733	55.4410	57.4370 (42a)
Hot water usage for baths												
	24.9180	24.5479	24.0268	23.0659	22.3464	21.5486	21.1177	21.6352	22.1987	23.0523	24.0330	24.8338 (42b)
Hot water usage for other uses												
	35.0539	33.7792	32.5045	31.2299	29.9552	28.6805	28.6805	29.9552	31.2299	32.5045	33.7792	35.0539 (42c)
Average daily hot water use (litres/day)												108.1288 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	117.6298	115.1186	112.0601	107.4088	103.6317	99.5711	98.0100	101.0553	104.2671	108.5301	113.2532	117.3247 (44)
Energy content (annual)	186.2969	163.9274	172.2323	147.0372	139.5082	122.4342	118.5347	125.1276	128.5717	147.2744	161.3500	183.7021 (45)
Distribution loss (46)m = 0.15 x (45)m												
	27.9445	24.5891	25.8348	22.0556	20.9262	18.3651	17.7802	18.7691	19.2858	22.0912	24.2025	27.5553 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	232.8918	206.0131	218.8272	192.1290	186.1031	167.5261	165.1296	171.7225	173.6635	193.8693	206.4418	230.2970 (62)
WWHRS	-26.3588	-23.3119	-24.4109	-20.2132	-18.8380	-16.1198	-15.1097	-16.0677	-16.6782	-19.6617	-22.2743	-25.8707 (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												
	206.5330	182.7012	194.4163	171.9159	167.2652	151.4063	150.0198	155.6548	156.9854	174.2076	184.1675	204.4264 (64)
Total per year (kWh/year)												2099.6992 (64)
Electric shower(s)												2100 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	99.2197	88.1744	94.5432	84.9633	83.6624	76.7829	76.6887	78.8808	78.8236	86.2446	89.7223	98.3569 (65)

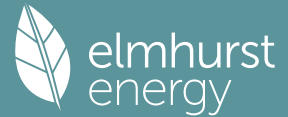
5. Internal gains (see Table 5 and 5a)												

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	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	89.3894	89.3894	89.3894	89.3894	89.3894	89.3894	89.3894	89.3894	89.3894	89.3894	89.3894	89.3894 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	174.0804	175.8868	171.3347	161.6438	149.4109	137.9136	130.2327	128.4263	132.9784	142.6693	154.9022	166.3995 (68)
Pumps, fans	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732 (71)
Total internal gains	133.3597	131.2119	127.0741	118.0046	112.4495	106.6429	103.0762	106.0226	109.4772	115.9202	124.6144	132.2001 (72)
	452.7445	461.9805	443.7132	427.9324	407.1646	389.8404	375.6132	376.7532	387.7395	403.8938	427.8005	443.9039 (73)

6. Solar gains												

[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
East	7.0400	19.6403	0.6300	0.7000	0.7700	42.2563 (76)						
South	4.0700	46.7521	0.6300	0.7000	0.7700	58.1523 (78)						

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Solar gains	100.4087	177.9009	257.4501	335.6565	386.2025	386.5863	371.4863	334.1691	285.0583	200.8095	121.6190	84.9985 (83)
Total gains	553.1531	639.8813	701.1632	763.5890	793.3672	776.4267	747.0995	710.9223	672.7978	604.7033	549.4195	528.9024 (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	80.7581	81.0253	81.2888	82.5501	82.7905	83.9280	83.9280	84.1421	83.4861	82.7905	82.3057	81.8049
alpha	6.3839	6.4017	6.4193	6.5033	6.5194	6.5952	6.5952	6.6095	6.5657	6.5194	6.4870	6.4537
util living area	0.9740	0.9405	0.8750	0.7340	0.5633	0.3946	0.2822	0.3093	0.4917	0.7782	0.9394	0.9790 (86)
MIT	20.4273	20.6139	20.7965	20.9427	20.9901	20.9992	20.9999	20.9999	20.9968	20.9318	20.6800	20.3963 (87)
Th 2	20.2325	20.2349	20.2372	20.2480	20.2500	20.2595	20.2595	20.2612	20.2558	20.2500	20.2459	20.2416 (88)
util rest of house	0.9675	0.9276	0.8515	0.6973	0.5200	0.3492	0.2348	0.2596	0.4397	0.7365	0.9240	0.9737 (89)
MIT 2	19.5845	19.8139	20.0294	20.1963	20.2426	20.2590	20.2594	20.2612	20.2539	20.1908	19.9067	19.5536 (90)
Living area fraction	19.9550	20.1655	20.3665	20.5244	20.5712	20.5844	20.5849	20.5859	20.5804	20.5165	20.2466	0.4395 (91)
MIT	19.9550	20.1655	20.3665	20.5244	20.5712	20.5844	20.5849	20.5859	20.5804	20.5165	20.2466	19.9240 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9550	20.1655	20.3665	20.5244	20.5712	20.5844	20.5849	20.5859	20.5804	20.5165	20.2466	19.9240 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9648	0.9262	0.8557	0.7111	0.5386	0.3691	0.2556	0.2815	0.4625	0.7519	0.9240	0.9711 (94)
Useful gains	533.6595	592.6874	600.0045	543.0108	427.3320	286.5904	190.9888	200.0946	311.1784	454.6474	507.6530	513.5927 (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	779.8321	757.9254	686.2354	566.4854	431.0590	286.8448	191.0064	200.1276	312.2652	481.8505	642.5681	773.2475 (97)
Space heating kWh	183.1524	111.0399	64.1557	16.9017	2.7729	0.0000	0.0000	0.0000	0.0000	20.2391	97.1389	193.1832 (98a)
Space heating requirement - total per year (kWh/year)												688.5838
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	183.1524	111.0399	64.1557	16.9017	2.7729	0.0000	0.0000	0.0000	0.0000	20.2391	97.1389	193.1832 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												688.5838
Space heating per m2										(98c) / (4) =		11.3910 (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	183.1524	111.0399	64.1557	16.9017	2.7729	0.0000	0.0000	0.0000	0.0000	20.2391	97.1389	193.1832 (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)	198.4316	120.3033	69.5079	18.3117	3.0042	0.0000	0.0000	0.0000	0.0000	21.9275	105.2426	209.2992 (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	206.5330	182.7012	194.4163	171.9159	167.2652	151.4063	150.0198	155.6548	156.9854	174.2076	184.1675	204.4264 (64)
Efficiency of water heater	83.7914	82.9792	81.8585	80.5306	79.9321	79.8000	79.8000	79.8000	79.8000	80.6508	82.6941	79.8000 (216)
Fuel for water heating, kWh/month	246.4847	220.1771	237.5029	213.4789	209.2590	189.7322	187.9948	195.0561	196.7235	216.0023	222.7092	83.9331 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	18.5733	14.9002	13.4160	9.8291	7.5923	6.2030	6.9260	9.0026	11.6935	15.3243	17.3293	19.0896 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-16.2835	-24.1718	-36.5663	-43.3478	-48.7209	-46.2151	-45.6646	-42.1315	-36.2387	-28.6234	-18.3326	-13.9408 (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)	-5.8442	-12.5674	-25.4916	-39.0460	-52.3718	-52.8826	-52.2476	-43.8856	-31.7159	-18.2053	-7.8779	-4.6005 (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												746.0279 (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												2578.6796 (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)												149.8975 (232)

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

PV generation	-746.9732 (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	2813.6319 (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	746.0279	0.2100	156.6659 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2578.6796	0.2100	541.5227 (264)
Space and water heating			698.1886 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	149.8975	0.1443	21.6348 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-400.2369	0.1335	-53.4340
PV Unit electricity exported	-346.7362	0.1253	-43.4567
Total			-96.8907 (269)
Total CO2, kg/year			634.8620 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5000 (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	746.0279	1.1300	843.0116 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2578.6796	1.1300	2913.9079 (278)
Space and water heating			3756.9195 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	149.8975	1.5338	229.9178 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-400.2369	1.4934	-597.6954
PV Unit electricity exported	-346.7362	0.4600	-159.5068
Total			-757.2022 (283)
Total Primary energy kWh/year			3359.7359 (286)
Target Primary Energy Rate (TPER)			55.5800 (287)

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Property Reference	Be Green			Issued on Date	06/01/2025
Assessment Reference	FF-Unit 7 (Block A)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	84 B	DER	4.70	TER	11.31
Environmental	97 A	% DER < TER			58.44
CO ₂ Emissions (t/year)	0.23	DFEE	15.13	TFEE	17.53
Compliance Check	See BREL	% DFEE < TFEE			13.72
% DPER < TPER	16.52	DPER	50.21	TPER	60.15
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.1400 (1b)	2.4000 (2b)	117.9360 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.1400		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	117.9360 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1696 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.3196 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2477 (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	0.3158	0.3096	0.3034	0.2724	0.2663	0.2353	0.2353	0.2291	0.2477	0.2663	0.2786	0.2910 (22b)
Effective ac	0.5499	0.5479	0.5460	0.5371	0.5354	0.5277	0.5277	0.5262	0.5307	0.5354	0.5388	0.5423 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.00)			8.8000	0.9615	8.4615		(27)
External Wall	20.6400	8.8000	11.8400	0.1300	1.5392	70.0000	828.8000 (29a)
Total net area of external elements A _{um} (A, m ²)			20.6400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	10.0007		(33)
Party Wall			48.7900	0.0000	0.0000	180.0000	8782.2000 (32)
Party Floor			49.1400			40.0000	1965.6000 (32d)
Party Ceiling			49.1400			30.0000	1474.2000 (32b)
Internal Wall			71.2300			9.0000	641.0700 (32c)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13691.8700 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							278.6298 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				4.9500	0.3000	1.4850	
E3 Sill				4.0000	0.0400	0.1600	
E4 Jamb				17.4000	0.0500	0.8700	
E7 Party floor between dwellings (in blocks of flats)				17.2000	0.0700	1.2040	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				40.6600	0.0000	0.0000	
E18 Party wall between dwellings				4.8000	0.0600	0.2880	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.0070 (36)

$$\begin{aligned} (33) + (36) + (36a) &= 14.0077 \quad (37) \end{aligned}$$
[illegible]

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.8709	110.5028	107.5950	103.1164	99.5000	95.6039	94.0646	96.9593	100.0183	104.1140	108.6633	112.5700 (44)
Energy conte	178.7599	157.3545	165.3695	141.1612	133.9462	117.5562	113.7630	120.0559	123.3325	141.2817	154.8107	176.2574 (45)
Energy content (annual)										Total =	Sum(45) m =	1723.6487

[illegible]

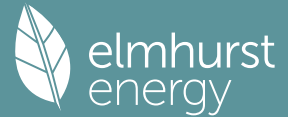
Total per year (kWh/year) = Sum(64)m = 2009.5440 (64)											
Electric shower(s)	2009 (64)										
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =										0.0000 (64a)	
Heat gains from water heating, kWh/month											
95.4036	84.8057	90.9513	81.7419	80.5031	73.8932	73.7921	75.8845	75.8138	82.9421	86.2803	94.5715 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.6200	84.8293	76.6200	79.1740	76.6200	79.1740	76.6200	76.6200	79.1740	76.6200	79.1740	76.6200 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	145.0005	146.5051	142.7135	134.6415	124.4520	114.8753	108.4775	106.9728	110.7645	118.8365	129.0260	138.6027 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241 (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)	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925 (71)
Water heating gains (Table 5)	128.2307	126.1990	122.2464	113.5304	108.2030	102.6294	99.1830	101.9954	105.2970	111.4813	119.8338	127.1123 (72)
Total internal gains	397.8233	405.5056	389.5520	375.3180	357.2472	344.6509	332.2526	333.5603	343.2076	354.9100	376.0059	390.3071 (73)

[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	
West					8.8000	19.6403	0.5700	0.7000			0.7700	47.7899 (80)	
Solar gains	47.7899	93.4872	153.9601	224.5416	275.1841	281.6999	268.1898	230.3711	179.0619	110.9304	59.5884	39.3001	(83)
Total gains	445.6132	498.9928	543.5121	599.8595	632.4313	626.3508	600.4424	563.9314	522.2696	465.8404	435.5943	429.6072	(84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	107.4144	107.6434	107.8689	108.9409	109.1438	110.0985	110.0985	110.2771	109.7288	109.1438	108.7340	108.3090
alpha	8.1610	8.1762	8.1913	8.2627	8.2763	8.3399	8.3399	8.3518	8.3153	8.2763	8.2489	8.2206

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util living area	0.9735	0.9399	0.8620	0.6923	0.5114	0.3529	0.2531	0.2813	0.4575	0.7540	0.9341	0.9788 (86)
Living	20.7073	20.8005	20.8929	20.9507	20.9614	20.9626	20.9627	20.9627	20.9622	20.9443	20.8339	20.6880
Non living	19.9903	20.1032	20.2090	20.2735	20.2838	20.2903	20.2903	20.2914	20.2879	20.2699	20.1503	19.9714
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	20.8503	20.8005	20.8929	20.9507	20.9614	20.9626	20.9627	20.9627	20.9622	20.9443	20.8339	20.7316 (87)
Th 2	20.3227	20.3241	20.3254	20.3316	20.3328	20.3382	20.3382	20.3392	20.3361	20.3328	20.3304	20.3280 (88)
util rest of house												
MIT	0.9664	0.9260	0.8369	0.6575	0.4751	0.3165	0.2151	0.2409	0.4137	0.7129	0.9168	0.9730 (89)
MIT 2	20.1902	20.1032	20.2090	20.2735	20.2838	20.2903	20.2903	20.2914	20.2879	20.2699	20.1503	20.0356 (90)
Living area fraction									fLA = Living area / (4) =			0.5275 (91)
MIT	20.5384	20.4710	20.5697	20.6307	20.6412	20.6449	20.6449	20.6455	20.6436	20.6256	20.5109	20.4028 (92)
Temperature adjustment												0.0000
adjusted MIT	20.5384	20.4710	20.5697	20.6307	20.6412	20.6449	20.6449	20.6455	20.6436	20.6256	20.5109	20.4028 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9689	0.9292	0.8463	0.6732	0.4919	0.3334	0.2327	0.2596	0.4340	0.7313	0.9219	0.9737	(94)
Useful gains	431.7442	463.6856	460.0012	403.8223	311.1191	208.8041	139.7301	146.4190	226.6817	340.6847	401.5576	418.3108	(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	574.9636	550.1604	496.0772	409.5368	311.5709	208.8187	139.7307	146.4204	226.8066	349.3592	469.0852	568.9643	(97)
Space heating kWh	106.5553	58.1111	26.8405	4.1145	0.3361	0.0000	0.0000	0.0000	0.0000	6.4538	48.6198	112.0862	(98a)
Space heating requirement - total per year (kWh/year)												363.1172	
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	106.5553	58.1111	26.8405	4.1145	0.3361	0.0000	0.0000	0.0000	0.0000	6.4538	48.6198	112.0862	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												363.1172	
Space heating per m2										(98c) / (4) =		7.3894	(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 %)												204.8476 (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	106.5553	58.1111	26.8405	4.1145	0.3361	0.0000	0.0000	0.0000	0.0000	6.4538	48.6198	112.0862 (98)	
Space heating efficiency (main heating system 1)	204.8476	204.8476	204.8476	204.8476	204.8476	0.0000	0.0000	0.0000	0.0000	204.8476	204.8476	204.8476 (210)	
Space heating fuel (main heating system)	52.0169	28.3679	13.1027	2.0085	0.1641	0.0000	0.0000	0.0000	0.0000	3.1506	23.7346	54.7169 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Water heating													
Water heating requirement	197.4956	174.7704	186.0429	164.5602	160.1635	145.0274	143.6892	149.0292	150.2482	166.6795	176.1593	195.4786 (64)	
Efficiency of water heater (217)m	153.3297	153.3297	153.3297	153.3297	153.3297	153.3297	153.3297	153.3297	153.3297	153.3297	153.3297	153.3297 (216)	
Fuel for water heating, kWh/month	128.8045	113.9834	121.3352	107.3244	104.4569	94.5853	93.7125	97.1952	97.9903	108.7066	114.8892	127.4891 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)	
Lighting	15.5947	12.5107	11.2645	8.2528	6.3747	5.2082	5.8152	7.5589	9.8182	12.8820	14.5502	16.0281 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												177.2622 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												153.3297	
Water heating fuel used												1310.4726 (219)	
Space cooling fuel												0.0000 (221)	
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000 (231)	
Electricity for lighting (calculated in Appendix L)												125.8583 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000 (233)	
Wind generation												0.0000 (234)	
Hydro-electric generation (Appendix N)												0.0000 (235a)	
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)	
Appendix Q - special features													
Energy saved or generated												-0.0000 (236)	

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Energy used
Total delivered energy for all uses

0.0000 (237)
1613.5931 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	177.2622	0.1594	28.2625 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	1310.4726	0.1407	184.4386 (264)
Space and water heating			212.7010 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	125.8583	0.1443	18.1652 (268)
Total CO ₂ , kg/year			230.8663 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.7000 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	177.2622	1.5901	281.8660 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1310.4726	1.5204	1992.4492 (278)
Space and water heating			2274.3152 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	125.8583	1.5338	193.0457 (282)
Total Primary energy kWh/year			2467.3609 (286)
Dwelling Primary energy Rate (DPER)			50.2100 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	49.1400 (1b)	x 2.4000 (2b)	= 117.9360 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	117.9360 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

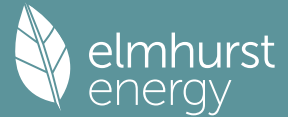
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1696 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4196	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3252 (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	0.4146	0.4065	0.3983	0.3577	0.3496	0.3089	0.3089	0.3008	0.3252	0.3496	0.3658	0.3821 (22b)
Effective ac	0.5859	0.5826	0.5793	0.5640	0.5611	0.5477	0.5477	0.5452	0.5529	0.5611	0.5669	0.5730 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (U _w = 1.20)			8.8000	1.1450	10.0763		(27)
External Wall	20.6400	8.8000	11.8400	0.1800	2.1312		(29a)
Total net area of external elements A _{um} (A, m ²)			20.6400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	12.2075		(33)
Party Wall			48.7900	0.0000	0.0000		(32)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							288.6298 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	4.9500	0.0500	0.2475	
E3 Sill	4.0000	0.0500	0.2000	
E4 Jamb	17.4000	0.0500	0.8700	
E7 Party floor between dwellings (in blocks of flats)	17.2000	0.0700	1.2040	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	40.6600	0.0000	0.0000	
E18 Party wall between dwellings	4.8000	0.0600	0.2880	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				2.8095 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		15.0170 (37)

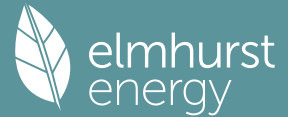
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	22.8044	22.6745	22.5472	21.9492	21.8373	21.3165	21.3165	21.2200	21.5171	21.8373	22.0636	22.3003 (38)
Average = Sum(39)m / 12 =	37.8214	37.6915	37.5642	36.9662	36.8543	36.3335	36.3335	36.2370	36.5341	36.8543	37.0807	37.3173 (39)
												36.9657
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7697	0.7670	0.7644	0.7523	0.7500	0.7394	0.7394	0.7374	0.7435	0.7500	0.7546	0.7594 (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												1.6648 (42)
Hot water usage for mixer showers												
Hot water usage for baths	52.1329	51.3494	50.2078	48.0235	46.4115	44.6138	43.5920	44.7250	45.9670	47.8971	50.1284	51.9332 (42a)
Hot water usage for other uses	22.5421	22.2073	21.7359	20.8666	20.2157	19.4940	19.1041	19.5723	20.0820	20.8543	21.7414	22.4659 (42b)
Average daily hot water use (litres/day)	31.6793	30.5274	29.3754	28.2234	27.0714	25.9195	25.9195	27.0714	28.2234	29.3754	30.5274	31.6793 (42c)
												97.7642 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	106.3543	104.0841	101.3190	97.1135	93.6986	90.0272	88.6156	91.3687	94.2724	98.1268	102.3972	106.0784 (44)
Energy content (annual)	168.4392	148.2144	155.7236	132.9435	126.1363	110.6990	107.1729	113.1336	116.2473	133.1572	145.8836	166.0931 (45)
Distribution loss	25.2659	22.2322	23.3585	19.9415	18.9205	16.6048	16.0759	16.9700	17.4371	19.9736	21.8825	24.9140 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	215.0341	190.3001	202.3185	178.0353	172.7312	155.7908	153.7678	159.7285	161.3391	179.7521	190.9754	212.6880 (62)
WWHRS	-23.8330	-21.0781	-22.0718	-18.2763	-17.0328	-14.5751	-13.6619	-14.5280	-15.0800	-17.7776	-20.1399	-23.3916 (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	191.2011	169.2220	180.2467	159.7590	155.6984	141.2157	140.1059	145.2004	146.2592	161.9744	170.8355	189.2963 (64)
12Total per year (kWh/year)												1951.0148 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	93.2820	82.9499	89.0540	80.2772	79.2163	72.8809	72.9109	74.8928	74.7257	81.5507	84.5798	92.5019 (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	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406	83.2406 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.7595	82.7695	74.7595	77.2515	74.7595	77.2515	74.7595	74.7595	77.2515	74.7595	77.2515	74.7595 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	145.0005	146.5051	142.7135	134.6415	124.4520	114.8753	108.4775	106.9728	110.7645	118.8365	129.0260	138.6027 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241	31.3241 (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)	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925	-66.5925 (71)
Water heating gains (Table 5)	125.3790	123.4373	119.6963	111.4961	106.4735	101.2234	97.9985	100.6624	103.7857	109.6111	117.4719	124.3305 (72)
Total internal gains	396.1112	403.6841	388.1414	374.3612	356.6571	341.3224	329.2077	330.3669	339.7739	354.1794	374.7216	388.6649 (73)

6. Solar gains												
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
West	8.8000											52.8204 (80)
Solar gains	52.8204	103.3279	170.1664	248.1775	304.1509	311.3526	296.4203	254.6207	197.9106	122.6073	65.8608	43.4369 (83)
Total gains	448.9316	507.0120	558.3078	622.5388	660.8080	652.6750	625.6280	584.9876	537.6844	476.7867	440.5824	432.1018 (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	104.1684	104.5273	104.8816	106.5783	106.9018	108.4343	108.4343	108.7229	107.8388	106.9018	106.2493	105.5756	
alpha	7.9446	7.9685	7.9921	8.1052	8.1268	8.2290	8.2290	8.2482	8.1893	8.1268	8.0833	8.0384	
util living area	0.9799	0.9509	0.8775	0.7039	0.5175	0.3562	0.2555	0.2849	0.4683	0.7729	0.9462	0.9838 (86)	
MIT	20.6027	20.7415	20.8864	20.9811	20.9983	20.9999	21.0000	21.0000	20.9994	20.9693	20.7953	20.5811 (87)	
Th 2	20.2797	20.2820	20.2843	20.2949	20.2969	20.3062	20.3062	20.3079	20.3026	20.2969	20.2929	20.2887 (88)	
util rest of house	0.9739	0.9384	0.8525	0.6671	0.4788	0.3176	0.2152	0.2421	0.4212	0.7301	0.9305	0.9790 (89)	
MIT 2	19.8353	20.0054	20.1730	20.2791	20.2958	20.3061	20.3062	20.3079	20.3023	20.2722	20.0816	19.8163 (90)	
Living area fraction									fLA = Living area / (4) =				0.5275 (91)
MIT	20.2401	20.3937	20.5493	20.6494	20.6664	20.6721	20.6721	20.6730	20.6700	20.6399	20.4581	20.2197 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.2401	20.3937	20.5493	20.6494	20.6664	20.6721	20.6721	20.6730	20.6700	20.6399	20.4581	20.2197 (93)	

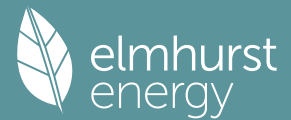
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9736	0.9405	0.8622	0.6858	0.4992	0.3380	0.2365	0.2647	0.4461	0.7515	0.9345	0.9785 (94)
Useful gains	437.0666	476.8532	481.3726	426.9562	329.8564	220.6012	147.9545	154.8373	239.8498	358.2981	411.7311	422.7936 (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	602.8784	583.9803	527.7512	434.3314	330.4492	220.6206	147.9553	154.8393	240.0298	370.0135	495.3268	597.8127 (97)
Space heating kWh	123.3640	71.9894	34.5057	5.3101	0.4410	0.0000	0.0000	0.0000	0.0000	8.7163	60.1889	130.2142 (98a)
Space heating requirement - total per year (kWh/year)												434.7295
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	123.3640	71.9894	34.5057	5.3101	0.4410	0.0000	0.0000	0.0000	0.0000	8.7163	60.1889	130.2142 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												434.7295
Space heating per m2										(98c) / (4) =		8.8468 (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	123.3640	71.9894	34.5057	5.3101	0.4410	0.0000	0.0000	0.0000	0.0000	8.7163	60.1889	130.2142 (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)	133.6554	77.9950	37.3843	5.7531	0.4778	0.0000	0.0000	0.0000	0.0000	9.4434	65.2100	141.0772 (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	191.2011	169.2220	180.2467	159.7590	155.6984	141.2157	140.1059	145.2004	146.2592	161.9744	170.8355	189.2963 (64)	
Efficiency of water heater	83.1031	82.2891	81.1210	80.0610	79.8228	79.8000	79.8000	79.8000	79.8000	80.2152	81.9643	79.8000 (216)	
Fuel for water heating, kWh/month	230.0770	205.6433	222.1948	199.5466	195.0549	176.9620	175.5713	181.9554	183.2821	201.9250	208.4268	227.4154 (219)	
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)	
Lighting	15.5336	12.4616	11.2203	8.2205	6.3497	5.1878	5.7924	7.5292	9.7797	12.8315	14.4932	15.9653 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-13.3209	-19.8196	-30.0548	-35.7251	-40.2493	-38.2278	-37.7861	-34.8233	-29.8851	-23.5233	-15.0173	-11.4003 (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)	-4.6668	-10.0458	-20.3922	-31.2531	-41.9293	-42.3290	-41.8070	-35.1003	-25.3555	-14.5439	-6.2892	-3.6719 (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													470.9963 (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													2408.0546 (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)													125.3647 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-607.2169 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)

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Appendix Q - special features

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2483.1986 (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	470.9963	0.2100	98.9092 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2408.0546	0.2100	505.6915 (264)
Space and water heating			604.6007 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	125.3647	0.1443	18.0940 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-329.8329	0.1334	-44.0152
PV Unit electricity exported	-277.3840	0.1253	-34.7625
Total			-78.7777 (269)
Total CO2, kg/year			555.8462 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	470.9963	1.1300	532.2258 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2408.0546	1.1300	2721.1017 (278)
Space and water heating			3253.3274 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	125.3647	1.5338	192.2885 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-329.8329	1.4931	-492.4843
PV Unit electricity exported	-277.3840	0.4600	-127.5950
Total			-620.0793 (283)
Total Primary energy kWh/year			2955.6375 (286)
Target Primary Energy Rate (TPER)			60.1500 (287)

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Property Reference	Be Green			Issued on Date	06/01/2025
Assessment Reference	FF-Unit 11 (Block B)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	87 B	DER	3.49	TER	11.18
Environmental	97 A	% DER < TER			68.78
CO ₂ Emissions (t/year)	0.21	DFEE	19.58	TFEE	23.01
Compliance Check	See BREL	% DFEE < TFEE			14.92
% DPER < TPER	37.54	DPER	36.97	TPER	59.18
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.9000 (1b)	x 2.4000 (2b)	= 150.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 150.9600 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1325 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2825 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2401 (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	0.3061	0.3001	0.2941	0.2641	0.2581	0.2281	0.2281	0.2221	0.2401	0.2581	0.2701	0.2821 (22b)
Effective ac	0.5469	0.5450	0.5433	0.5349	0.5333	0.5260	0.5260	0.5247	0.5288	0.5333	0.5365	0.5398 (25)

3. Heat losses and heat loss parameter

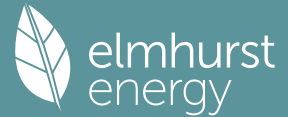
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.00)			11.4800	0.9615	11.0385		(27)
External Wall	39.0200	11.4800	27.5400	0.1300	3.5802	70.0000	1927.8000 (29a)
Total net area of external elements A _{um} (A, m ²)			39.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	14.6187		(33)
Party Wall			39.0200	0.0000	0.0000	180.0000	7023.6000 (32)
Party Floor			62.9000			40.0000	2516.0000 (32d)
Party Ceiling			62.9000			30.0000	1887.0000 (32b)
Internal Wall			104.0600			9.0000	936.5400 (32c)

Heat capacity C_m = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14290.9400 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 227.2010 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.1500	0.3000	1.8450
E3 Sill	5.2000	0.0400	0.2080
E4 Jamb	17.4000	0.0500	0.8700
E16 Corner (normal)	2.4000	0.0900	0.2160
E18 Party wall between dwellings	4.8000	0.0600	0.2880
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	32.5200	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	32.5200	0.0700	2.2764

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Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges
 Total fabric heat loss

(33) + (36) + (36a) =
 20.3221 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.2429	27.1523	27.0634	26.6460	26.5680	26.2045	26.2045	26.1371	26.3445	26.5680	26.7259	26.8911	(38)
Heat transfer coeff	47.5650	47.4743	47.3855	46.9681	46.8900	46.5265	46.5265	46.4592	46.6665	46.8900	47.0480	47.2131	(39)
Average = Sum(39)m / 12 =												46.9677	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7562	0.7548	0.7533	0.7467	0.7455	0.7397	0.7397	0.7386	0.7419	0.7455	0.7480	0.7506	(40)
HLP (average)												0.7467	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0623 (42)
Hot water usage for mixer showers													
66.1478	65.1538	63.7052	60.9336	58.8883	56.6074	55.3109	56.7485	58.3243	60.7734	63.6045	65.8944	(42a)	
Hot water usage for baths													
25.4083	25.0310	24.4996	23.5198	22.7862	21.9727	21.5332	22.0609	22.6355	23.5059	24.5059	25.3224	(42b)	
Hot water usage for other uses													
35.7503	34.4503	33.1503	31.8503	30.5503	29.2503	29.2503	30.5503	31.8503	33.1503	34.4503	35.7503	(42c)	
Average daily hot water use (litres/day)												117.0439	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
127.3065	124.6350	121.3551	116.3037	112.2247	107.8303	106.0944	109.3597	112.8101	117.4296	122.5607	126.9671	(44)	
Energy content	201.6223	177.4786	186.5182	159.2140	151.0761	132.5899	128.3120	135.4101	139.1061	159.3509	174.6101	198.7999	(45)
Energy content (annual)										Total = Sum(45)m =	1944.0882		
Distribution loss (46)m = 0.15 x (45)m													
30.2434	26.6218	27.9777	23.8821	22.6614	19.8885	19.2468	20.3115	20.8659	23.9026	26.1915	29.8200	(46)	
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2960	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6998	(55)
Total storage loss													
21.6950	19.5955	21.6950	20.9952	21.6950	20.9952	21.6950	21.6950	20.9952	21.6950	20.9952	21.6950	(56)	
If cylinder contains dedicated solar storage													
21.6950	19.5955	21.6950	20.9952	21.6950	20.9952	21.6950	21.6950	20.9952	21.6950	20.9952	21.6950	(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													
246.5798	218.0854	231.4757	202.7212	196.0335	176.0971	173.2694	180.3675	182.6133	204.3083	218.1173	243.7573	(62)	
WWHRS	-29.5743	-26.1557	-27.3888	-22.6790	-21.1360	-18.0862	-16.9530	-18.0278	-18.7127	-22.0602	-24.9916	-29.0266	(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													
217.0055	191.9296	204.0869	180.0422	174.8975	158.0109	156.3164	162.3398	163.9006	182.2481	193.1258	214.7307	(64)	
12Total per year (kWh/year)												2198.6339	(64)
Electric shower(s)												2199	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
103.0054	91.4970	97.9833	87.7444	86.1987	78.8919	78.6297	80.9898	81.0585	88.9501	92.8636	102.0669	(65)	

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

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.8578	105.0211	94.8578	98.0197	94.8578	98.0197	94.8578	94.8578	98.0197	94.8578	98.0197	94.8578	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.1971	182.0670	177.3549	167.3236	154.6607	142.7595	134.8087	132.9388	137.6509	147.6822	160.3451	172.2463	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	(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)	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	(71)
Water heating gains (Table 5)	138.4481	136.1563	131.6979	121.8672	115.8585	109.5721	105.6850	108.8573	112.5813	119.5566	128.9773	137.1867	(72)
Total internal gains	467.4379	477.1793	457.8456	441.1455	419.3120	404.2862	389.2865	390.5888	402.1868	416.0316	441.2770	458.2258	(73)

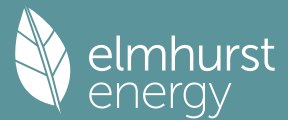
6. Solar gains

[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				11.4800	10.6334	0.5700	0.7000		0.7700		33.7536 (74)	
Solar gains	33.7536	64.5048	109.6095	176.0609	237.1701	253.8977	237.0459	188.0657	131.7861	76.7846	41.6394	28.1387 (83)
Total gains	501.1915	541.6841	567.4551	617.2063	656.4821	658.1839	626.3324	578.6545	533.9729	492.8161	482.9164	486.3644 (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)													
tau	83.4586	83.6180	83.7748	84.5192	84.6599	85.3214	85.3214	85.4450	85.0654	84.6599	84.3757	84.0805	

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alpha	6.5639	6.5745	6.5850	6.6346	6.6440	6.6881	6.6881	6.6963	6.6710	6.6440	6.6250	6.6054
util living area	0.9815	0.9673	0.9355	0.8305	0.6489	0.4512	0.3267	0.3690	0.5947	0.8646	0.9611	0.9843 (86)
Living	20.5012	20.5938	20.7194	20.8698	20.9381	20.9523	20.9534	20.9533	20.9467	20.8611	20.6692	20.4830
Non living	19.7116	19.8279	19.9823	20.1596	20.2288	20.2456	20.2462	20.2472	20.2398	20.1546	19.9279	19.6930
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	20.7448	20.5938	20.7194	20.8698	20.9381	20.9523	20.9534	20.9533	20.9467	20.8611	20.6692	20.5553 (87)
Th 2	20.2915	20.2927	20.2939	20.2998	20.3008	20.3059	20.3059	20.3068	20.3040	20.3008	20.2986	20.2963 (88)
util rest of house	0.9770	0.9597	0.9210	0.7999	0.6048	0.4028	0.2753	0.3136	0.5380	0.8319	0.9507	0.9805 (89)
MIT 2	20.0603	19.8279	19.9823	20.1596	20.2288	20.2456	20.2462	20.2472	20.2398	20.1546	19.9279	19.8017 (90)
Living area fraction									fLA = Living area /	(4) =		0.4119 (91)
MIT	20.3423	20.1434	20.2859	20.4521	20.5210	20.5367	20.5375	20.5381	20.5310	20.4456	20.2332	20.1121 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3423	20.1434	20.2859	20.4521	20.5210	20.5367	20.5375	20.5381	20.5310	20.4456	20.2332	20.1121 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9773	0.9579	0.9208	0.8069	0.6189	0.4189	0.2924	0.3321	0.5567	0.8391	0.9496	0.9793 (94)
Useful gains	489.8220	518.8527	522.5232	498.0215	406.2929	275.7314	183.1651	192.1709	297.2647	413.5368	458.5930	476.2912 (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	763.0494	723.6697	653.2522	542.5821	413.6159	276.2138	183.1999	192.2511	300.1135	461.6608	617.8916	751.2622 (97)
Space heating kWh	203.2812	137.6370	97.2624	32.0836	5.4483	0.0000	0.0000	0.0000	0.0000	35.8042	114.6950	204.5784 (98a)
Space heating requirement - total per year (kWh/year)												830.7902
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	203.2812	137.6370	97.2624	32.0836	5.4483	0.0000	0.0000	0.0000	0.0000	35.8042	114.6950	204.5784 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												830.7902
Space heating per m2										(98c) / (4) =		13.2081 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												238.8287 (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	203.2812	137.6370	97.2624	32.0836	5.4483	0.0000	0.0000	0.0000	0.0000	35.8042	114.6950	204.5784 (98)
Space heating efficiency (main heating system 1)	238.8287	238.8287	238.8287	238.8287	238.8287	0.0000	0.0000	0.0000	0.0000	238.8287	238.8287	238.8287 (210)
Space heating fuel (main heating system)	85.1159	57.6300	40.7248	13.4337	2.2813	0.0000	0.0000	0.0000	0.0000	14.9916	48.0240	85.6591 (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	217.0055	191.9296	204.0869	180.0422	174.8975	158.0109	156.3164	162.3398	163.9006	182.2481	193.1258	214.7307 (64)
Efficiency of water heater	219.4950	219.4950	219.4950	219.4950	219.4950	219.4950	219.4950	219.4950	219.4950	219.4950	219.4950	219.4950 (216)
Fuel for water heating, kWh/month	98.8658	87.4414	92.9802	82.0256	79.6817	71.9884	71.2164	73.9606	74.6717	83.0306	87.9864	97.8294 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	20.2968	16.2829	14.6609	10.7412	8.2968	6.7786	7.5686	9.8380	12.7786	16.7662	18.9374	20.8610 (232)
Electricity generated by PVs (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 (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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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												347.8603 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												219.4950
Water heating fuel used												1001.6781 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												163.8072 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1513.3456 (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	347.8603	0.1575	54.8006	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1001.6781	0.1408	141.0408	(264)
Space and water heating			195.8415	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	163.8072	0.1443	23.6424	(268)
Total CO2, kg/year			219.4839	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4900	(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	347.8603	1.5832	550.7284	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1001.6781	1.5206	1523.1911	(278)
Space and water heating			2073.9195	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	163.8072	1.5338	251.2529	(282)
Total Primary energy kWh/year			2325.1724	(286)
Dwelling Primary energy Rate (DPER)			36.9700	(287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	62.9000 (1b)	x 2.4000 (2b)	= 150.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 150.9600 (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) =	0.1325 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3825	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3251 (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	0.4145	0.4064	0.3983	0.3576	0.3495	0.3089	0.3089	0.3007	0.3251	0.3495	0.3658	0.3820	(22b)
Effective ac	0.5859	0.5826	0.5793	0.5639	0.5611	0.5477	0.5477	0.5452	0.5528	0.5611	0.5669	0.5730	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			11.4800	1.1450	13.1450			(27)
External Wall	39.0200	11.4800	27.5400	0.1800	4.9572			(29a)
Total net area of external elements Aum (A, m2)			39.0200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.1022			(33)
Party Wall			39.0200	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							237.2010	(35)
List of Thermal Bridges								

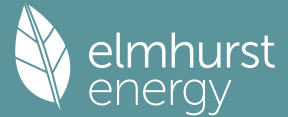
Ventilation heat loss calculated monthl (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.1883	Feb 29.0221	Mar 28.8592	Apr 28.0941	May 27.9509	Jun 27.2845	Jul 27.2845	Aug 27.1611	Sep 27.5412	Oct 27.9509	Nov 28.2405	Dec 28.5433 (38)
Heat transfer coeff	51.5084	51.3422	51.1793	50.4142	50.2710	49.6046	49.6046	49.4812	49.8613	50.2710	50.5606	50.8634 (39)
Average = Sum(39)m / 12 =												50.4135
HLP	Jan 0.8189	Feb 0.8163	Mar 0.8137	Apr 0.8015	May 0.7992	Jun 0.7886	Jul 0.7886	Aug 0.7867	Sep 0.7927	Oct 0.7992	Nov 0.8038	Dec 0.8086 (40)
HLP (average)												0.8015
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy													2.0623 (42)
Hot water usage for mixer showers	58.7981	57.9145	56.6268	54.1632	52.3452	50.3177	49.1652	50.4431	51.8439	54.0208	56.5373	58.5728 (42a)	
Hot water usage for baths	25.4083	25.0310	24.4996	23.5198	22.7862	21.9727	21.5332	22.0609	22.6355	23.5059	24.5059	25.3224 (42b)	
Hot water usage for other uses	35.7503	34.4503	33.1503	31.8503	30.5503	29.2503	29.2503	30.5503	31.8503	33.1503	34.4503	35.7503 (42c)	
Average daily hot water use (litres/day)												110.2677 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.9567	117.3957	114.2767	109.5333	105.6816	101.5406	99.9487	103.0543	106.3296	110.6770	115.4935	119.6455 (44)	
Energy content (annual)	189.9821	167.1700	175.6391	149.9457	142.2677	124.8560	120.8793	127.6027	131.1150	150.1877	164.5417	187.3360 (45)	
Distribution loss (46)m = 0.15 x (45)m	28.4973	25.0755	26.3459	22.4918	21.3402	18.7284	18.1319	19.1404	19.6673	22.5281	24.6812	28.1004 (46)	
Water storage loss:													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.7527 (55)	
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)	
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	236.5770	209.2557	222.2340	195.0375	188.8626	169.9478	167.4742	174.1976	176.2069	196.7826	209.6335	233.9309 (62)	
WWHRS	-26.8800	-23.7729	-24.8936	-20.6129	-19.2105	-16.4386	-15.4085	-16.3854	-17.0080	-20.0505	-22.7148	-26.3822 (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	209.6970	185.4828	197.3404	174.4246	169.6521	153.5093	152.0657	157.8122	159.1989	176.7320	186.9187	207.5487 (64)	
12Total per year (kWh/year)												2130.3823 (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	100.4450	89.2526	95.6759	85.9304	84.5799	77.5881	77.4683	79.7038	79.6692	87.2133	90.7836	99.5651 (65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165	103.1165 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	92.6284	102.5529	92.6284	95.7160	92.6284	95.7160	92.6284	92.6284	95.7160	92.6284	95.7160	92.6284 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.1971	182.0670	177.3549	167.3236	154.6607	142.7595	134.8087	132.9388	137.6509	147.6822	160.3451	172.2463 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116	33.3116 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932	-82.4932 (71)
Water heating gains (Table 5)	135.0067	132.8164	128.5967	119.3478	113.6827	107.7612	104.1241	107.1288	110.6517	117.2222	126.0883	133.8241 (72)
Total internal gains	464.7671	474.3711	455.5149	439.3223	417.9068	400.1716	385.4961	386.6309	397.9535	414.4678	439.0843	455.6338 (73)

[Jan]												Gains
	Area				Solar flux		g		FF		Access	Gains
	m2				Table 6a		Specific data		Specific data		factor	W
					W/m2		or Table 6b		or Table 6c		Table 6d	
North	11.4800				10.6334		0.6300		0.7000		0.7700	37.3066 (74)
Solar gains	37.3066	71.2948	121.1473	194.5936	262.1354	280.6237	261.9981	207.8621	145.6583	84.8671	46.0225	31.1006 (83)
Total gains	502.0737	545.6659	576.6622	633.9159	680.0422	680.7954	647.4942	594.4930	543.6118	499.3349	485.1068	486.7344 (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	80.4611	80.7216	80.9785	82.2076	82.4417	83.5492	83.5492	83.7576	83.1191	82.4417	81.9694	81.4815
alpha	6.3641	6.3814	6.3986	6.4805	6.4961	6.5699	6.5699	6.5838	6.5413	6.4961	6.4646	6.4321
util living area	0.9862	0.9748	0.9475	0.8491	0.6674	0.4647	0.3369	0.3824	0.6208	0.8857	0.9699	0.9883 (86)
MIT	20.3082	20.4412	20.6287	20.8635	20.9741	20.9978	20.9998	20.9995	20.9875	20.8467	20.5584	20.2907 (87)
Th 2	20.2370	20.2393	20.2415	20.2520	20.2540	20.2632	20.2632	20.2649	20.2597	20.2540	20.2500	20.2459 (88)
util rest of house	0.9825	0.9683	0.9343	0.8182	0.6201	0.4119	0.2806	0.3216	0.5590	0.8539	0.9611	0.9852 (89)
MIT 2	19.4403	19.6087	19.8410	20.1211	20.2337	20.2620	20.2631	20.2647	20.2518	20.1102	19.7654	19.4255 (90)
Living area fraction												0.4119 (91)
MIT	19.7978	19.9516	20.1655	20.4269	20.5387	20.5651	20.5666	20.5674	20.5548	20.4135	20.0921	19.7819 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7978	19.9516	20.1655	20.4269	20.5387	20.5651	20.5666	20.5674	20.5548	20.4135	20.0921	19.7819 (93)

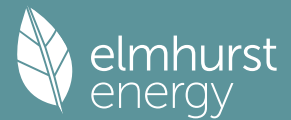
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9799	0.9655	0.9328	0.8258	0.6385	0.4336	0.3038	0.3467	0.5841	0.8613	0.9589	0.9828 (94)
Useful gains	492.0017	526.8158	537.9292	523.5144	434.2104	295.1943	196.7056	206.0817	317.5053	430.0791	465.1566	478.3478 (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	798.2674	772.7836	699.3906	581.1215	444.3291	295.8969	196.7603	206.2081	321.8466	493.3371	656.8876	792.5474 (97)
Space heating kWh	227.8617	165.2903	120.1273	41.4771	7.5283	0.0000	0.0000	0.0000	0.0000	47.0640	138.0463	233.7645 (98a)
Space heating requirement - total per year (kWh/year)												981.1594
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	227.8617	165.2903	120.1273	41.4771	7.5283	0.0000	0.0000	0.0000	0.0000	47.0640	138.0463	233.7645 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												981.1594
Space heating per m2										(98c) / (4) =		15.5987 (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	227.8617	165.2903	120.1273	41.4771	7.5283	0.0000	0.0000	0.0000	0.0000	47.0640	138.0463	233.7645 (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)	246.8707	179.0794	130.1487	44.9373	8.1563	0.0000	0.0000	0.0000	0.0000	50.9902	149.5626	253.2660 (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	209.6970	185.4828	197.3404	174.4246	169.6521	153.5093	152.0657	157.8122	159.1989	176.7320	186.9187	207.5487 (64)	
Efficiency of water heater	84.2465	83.8023	82.9824	81.3846	80.1451	79.8000	79.8000	79.8000	79.8000	81.5379	83.3903	79.8000 (216)	
Fuel for water heating, kWh/month	248.9089	221.3338	237.8098	214.3213	211.6812	192.3675	190.5585	197.7596	199.4974	216.7483	224.1492	246.1231 (219)	
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)	
Lighting	19.2463	15.4401	13.9021	10.1853	7.8674	6.4277	7.1769	9.3288	12.1172	15.8985	17.9573	19.7813 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-16.9225	-25.1090	-37.9659	-44.9832	-50.5355	-47.9248	-47.3510	-43.6973	-37.6023	-29.7204	-19.0471	-14.4889 (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)	-6.1020	-13.1192	-26.6070	-40.7500	-54.6544	-55.1893	-54.5295	-45.8059	-33.1065	-19.0062	-8.2256	-4.8038 (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													1063.0113 (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													2601.2587 (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)													155.3291 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-777.2475 (233)
Wind generation													0.0000 (234)

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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	3128.3515 (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	1063.0113	0.2100	223.2324 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2601.2587	0.2100	546.2643 (264)
Space and water heating			769.4967 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	155.3291	0.1443	22.4188 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.3479	0.1335	-55.4562
PV Unit electricity exported	-361.8996	0.1253	-45.3578
Total			-100.8140 (269)
Total CO2, kg/year			703.0307 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1063.0113	1.1300	1201.2028 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2601.2587	1.1300	2939.4223 (278)
Space and water heating			4140.6250 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	155.3291	1.5338	238.2489 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.3479	1.4934	-620.2793
PV Unit electricity exported	-361.8996	0.4600	-166.4848
Total			-786.7641 (283)
Total Primary energy kWh/year			3722.2107 (286)
Target Primary Energy Rate (TPER)			59.1800 (287)

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Property Reference	Be Green			Issued on Date	06/01/2025
Assessment Reference	FF-Unit 16 (Block A)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	85 B	DER	4.01	TER	14.39
Environmental	97 A	% DER < TER			72.13
CO ₂ Emissions (t/year)	0.23	DFEE	29.13	TFEE	36.98
Compliance Check	See BREL	% DFEE < TFEE			21.21
% DPER < TPER	44.73	DPER	42.28	TPER	76.49
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	60.4500 (1b)	2.4000 (2b)	145.0800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.4500		145.0800 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	145.0800 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1379 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2879 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2447 (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	0.3120	0.3058	0.2997	0.2691	0.2630	0.2324	0.2324	0.2263	0.2447	0.2630	0.2753	0.2875 (22b)
Effective ac	0.5487	0.5468	0.5449	0.5362	0.5346	0.5270	0.5270	0.5256	0.5299	0.5346	0.5379	0.5413 (25)

3. Heat losses and heat loss parameter

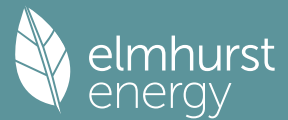
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.00)			11.1100	0.9615	10.6827		(27)
External Wall	38.1400	11.1100	27.0300	0.1300	3.5139	70.0000	1892.1000 (29a)
External Roof	60.4500		60.4500	0.1000	6.0450	9.0000	544.0500 (30)
Total net area of external elements Aum(A, m ²)			98.5900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.2416		(33)
Party Wall			38.1400	0.0000	0.0000	180.0000	6865.2000 (32)
Party Floor			60.4500			40.0000	2418.0000 (32d)
Internal Wall			98.7800			9.0000	889.0200 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12608.3700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 208.5752 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.0000	0.3000	1.8000
E3 Sill	3.2000	0.0400	0.1280
E4 Jamb	21.8000	0.0500	1.0900
E7 Party floor between dwellings (in blocks of flats)	11.9000	0.0700	0.8330
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.8900	0.0000	0.0000
E18 Party wall between dwellings	4.8000	0.0600	0.2880
E9 Balcony between dwellings, wall insulation continuous	3.0000	0.0200	0.0600

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E16 Corner (normal)	2.4000	0.0900	0.2160										
E15 Flat roof with parapet	15.8900	0.2800	4.4492										
P4 Party wall - Roof (insulation at ceiling level)	15.8900	0.1200	1.9068										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				10.7710 (36)									
Point Thermal bridges				0.0000									
Total fabric heat loss		(33) + (36) + (36a) =		31.0126 (37)									
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.2679	26.1774	26.0887	25.6723	25.5943	25.2316	25.2316	25.1644	25.3713	25.5943	25.7520	25.9168	(38)
Heat transfer coeff	57.2805	57.1900	57.1013	56.6848	56.6069	56.2442	56.2442	56.1770	56.3839	56.6069	56.7646	56.9294	(39)
Average = Sum(39)m / 12 =												56.6845	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9476	0.9461	0.9446	0.9377	0.9364	0.9304	0.9304	0.9293	0.9327	0.9364	0.9390	0.9418	(40)
HLP (average)												0.9377	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.9943 (42)
Hot water usage for mixer showers	64.8652	63.8904	62.4699	59.7521	57.7464	55.5097	54.2383	55.6480	57.1934	59.5949	62.3711	64.6166	(42a)
Hot water usage for baths	24.9180	24.5479	24.0268	23.0659	22.3464	21.5486	21.1177	21.6352	22.1987	23.0523	24.0330	24.8338	(42b)
Hot water usage for other uses	35.0539	33.7792	32.5045	31.2299	29.9552	28.6805	28.6805	29.9552	31.2299	32.5045	33.7792	35.0539	(42c)
Average daily hot water use (litres/day)													114.7736 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	124.8371	122.2175	119.0012	114.0479	110.0480	105.7388	104.0365	107.2384	110.6219	115.1518	120.1833	124.5043	(44)
Distribution loss (46)m = 0.15 x (45)m	197.7114	174.0361	182.9005	156.1258	148.1458	130.0182	125.8232	132.7836	136.4078	156.2599	171.2232	194.9437	(45)
	29.6567	26.1054	27.4351	23.4189	22.2219	19.5027	18.8735	19.9175	20.4612	23.4390	25.6835	29.2416	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.2960 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.6998 (55)
Total storage loss	21.6950	19.5955	21.6950	20.9952	21.6950	20.9952	21.6950	21.6950	20.9952	21.6950	20.9952	21.6950	(56)
If cylinder contains dedicated solar storage	21.6950	19.5955	21.6950	20.9952	21.6950	20.9952	21.6950	21.6950	20.9952	21.6950	20.9952	21.6950	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	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	(61)
Total heat required for water heating calculated for each month	242.6689	214.6429	227.8579	199.6330	193.1032	173.5254	170.7806	177.7410	179.9150	201.2173	214.7304	239.9011	(62)
WWHRS	-29.0008	-25.6485	-26.8577	-22.2392	-20.7262	-17.7355	-16.6242	-17.6782	-18.3499	-21.6325	-24.5069	-28.4638	(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	213.6681	188.9943	201.0002	177.3938	172.3771	155.7899	154.1564	160.0628	161.5652	179.5849	190.2234	211.4374	(64)
12Total per year (kWh/year)													2166.2534 (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	101.7050	90.3524	96.7804	86.7176	85.2244	78.0368	77.8022	80.1165	80.1614	87.9224	91.7375	100.7847	(65)

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

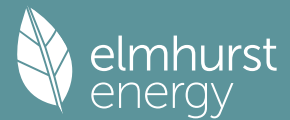
Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	91.5122	101.3171	91.5122	94.5626	91.5122	94.5626	91.5122	91.5122	94.5626	91.5122	94.5626	91.5122 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	174.0804	175.8868	171.3347	161.6438	149.4109	137.9136	130.2327	128.4263	132.9784	142.6693	154.9022	166.3995 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716 (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)												
	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732 (71)
Water heating gains (Table 5)												
	136.7003	134.4530	130.0811	120.4411	114.5490	108.3845	104.5728	107.6834	111.3352	118.1752	127.4132	135.4633 (72)
Total internal gains												
	455.2078	464.5718	445.8430	429.5625	408.3870	393.7756	379.2326	380.5369	391.7912	405.2716	429.7930	446.2900 (73)

6. Solar gains

[Jan]												Gains
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		W	
North					7.0400	10.6334	0.5700	0.7000	0.7700		20.6991 (74)	
East					4.0700	19.6403	0.5700	0.7000	0.7700		22.1028 (76)	
Solar gains	42.8019	82.7948	138.4235	211.8181	272.7150	285.9865	269.4039	221.8761	163.6327	98.3927	53.0946	35.4320 (83)
Total gains	498.0097	547.3666	584.2665	641.3807	681.1020	679.7621	648.6366	602.4130	555.4239	503.6643	482.8875	481.7221 (84)

7. Mean internal temperature (heating season)

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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	61.1434	61.2402	61.3353	61.7859	61.8710	62.2700	62.2700	62.3445	62.1157	61.8710	61.6991	61.5205
alpha	5.0762	5.0827	5.0890	5.1191	5.1247	5.1513	5.1513	5.1563	5.1410	5.1247	5.1133	5.1014
util living area	0.9822	0.9699	0.9433	0.8633	0.7138	0.5199	0.3799	0.4258	0.6626	0.8945	0.9668	0.9848 (86)
Living	20.1919	20.3157	20.4964	20.7277	20.8751	20.9294	20.9381	20.9369	20.9060	20.7181	20.4236	20.1679
Non living	19.1884	19.3447	19.5693	19.8478	20.0054	20.0582	20.0639	20.0643	20.0394	19.8442	19.4866	19.1621
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	20.5866	20.3157	20.4964	20.7277	20.8751	20.9294	20.9381	20.9369	20.9060	20.7181	20.4236	20.2843 (87)
Th 2	20.1273	20.1285	20.1298	20.1356	20.1366	20.1417	20.1417	20.1427	20.1398	20.1366	20.1344	20.1321 (88)
util rest of house	0.9779	0.9627	0.9298	0.8336	0.6628	0.4540	0.3066	0.3480	0.5929	0.8643	0.9577	0.9810 (89)
MIT 2	19.7530	19.3447	19.5693	19.8478	20.0054	20.0582	20.0639	20.0643	20.0394	19.8442	19.4866	19.3369 (90)
Living area fraction										fLA = Living area / (4) =		0.4395 (91)
MIT	20.1194	19.7715	19.9768	20.2346	20.3876	20.4411	20.4481	20.4478	20.4203	20.2283	19.8984	19.7533 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1194	19.7715	19.9768	20.2346	20.3876	20.4411	20.4481	20.4478	20.4203	20.2283	19.8984	19.7533 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9778	0.9593	0.9271	0.8373	0.6783	0.4773	0.3329	0.3759	0.6165	0.8679	0.9547	0.9791 (94)
Useful gains	486.9734	525.0689	541.6772	537.0303	461.9661	324.4727	215.9296	226.4608	342.4028	437.1199	461.0308	471.6336 (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	906.1414	850.4996	769.5426	642.4983	491.7805	328.5287	216.4355	227.3947	356.3611	545.0292	726.4982	885.4399 (97)
Space heating kWh	311.8610	218.6894	169.5318	75.9369	22.1819	0.0000	0.0000	0.0000	0.0000	80.2845	191.1365	307.8718 (98a)
Space heating requirement - total per year (kWh/year)												1377.4939
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	311.8610	218.6894	169.5318	75.9369	22.1819	0.0000	0.0000	0.0000	0.0000	80.2845	191.1365	307.8718 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1377.4939
Space heating per m2										(98c) / (4) =		22.7873 (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 %)												266.0229 (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	311.8610	218.6894	169.5318	75.9369	22.1819	0.0000	0.0000	0.0000	0.0000	80.2845	191.1365	307.8718 (98)
Space heating efficiency (main heating system 1)	266.0229	266.0229	266.0229	266.0229	266.0229	0.0000	0.0000	0.0000	0.0000	266.0229	266.0229	266.0229 (210)
Space heating fuel (main heating system)	117.2309	82.2070	63.7283	28.5453	8.3384	0.0000	0.0000	0.0000	0.0000	30.1796	71.8497	115.7314 (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	213.6681	188.9943	201.0002	177.3938	172.3771	155.7899	154.1564	160.0628	161.5652	179.5849	190.2234	211.4374 (64)
Efficiency of water heater (217)m	219.7188	219.7188	219.7188	219.7188	219.7188	219.7188	219.7188	219.7188	219.7188	219.7188	219.7188	219.7188 (216)
Fuel for water heating, kWh/month	97.2462	86.0165	91.4807	80.7368	78.4535	70.9042	70.1608	72.8489	73.5327	81.7340	86.5759	96.2309 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	19.2845	15.4707	13.9297	10.2055	7.8830	6.4405	7.1911	9.3473	12.1412	15.9299	17.9928	19.8204 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												517.8104 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												219.7188
Water heating fuel used												985.9210 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												155.6366 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)

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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	1659.3680 (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	517.8104	0.1565	81.0127 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	985.9210	0.1408	138.8124 (264)
Space and water heating			219.8251 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	155.6366	0.1443	22.4632 (268)
Total CO2, kg/year			242.2883 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0100 (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	517.8104	1.5792	817.7239 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	985.9210	1.5206	1499.1935 (278)
Space and water heating			2316.9174 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	155.6366	1.5338	238.7207 (282)
Total Primary energy kWh/year			2555.6381 (286)
Dwelling Primary energy Rate (DPER)			42.2800 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	60.4500 (1b)	x 2.4000 (2b)	= 145.0800 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.4500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 145.0800 (5)

2. Ventilation rate

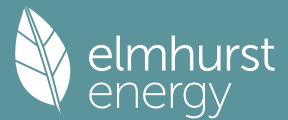
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1379 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3879 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3297 (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	0.4203	0.4121	0.4039	0.3626	0.3544	0.3132	0.3132	0.3050	0.3297	0.3544	0.3709	0.3874 (22b)
Effective ac	0.5883	0.5849	0.5815	0.5658	0.5628	0.5490	0.5490	0.5465	0.5543	0.5628	0.5688	0.5750 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			11.1100	1.1450	12.7214		(27)
External Wall	38.1400	11.1100	27.0300	0.1800	4.8654		(29a)
External Roof	60.4500		60.4500	0.1100	6.6495		(30)
Total net area of external elements Aum(A, m2)			98.5900				(31)

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Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 24.2363 (33)
Party Wall 38.1400 0.0000 0.0000 (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.5752 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	3.2000	0.0500	0.1600
E4 Jamb	21.8000	0.0500	1.0900
E7 Party floor between dwellings (in blocks of flats)	11.9000	0.0700	0.8330
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.8900	0.0000	0.0000
E18 Party wall between dwellings	4.8000	0.0600	0.2880
E9 Balcony between dwellings, wall insulation continuous	3.0000	0.0200	0.0600
E16 Corner (normal)	2.4000	0.0900	0.2160
E15 Flat roof with parapet	15.8900	0.5600	8.8984
P4 Party wall - Roof (insulation at ceiling level)	15.8900	0.1200	1.9068

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.7522 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 37.9885 (37)

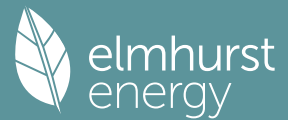
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	28.1677	28.0035	27.8425	27.0863	26.9449	26.2863	26.2863	26.1643	26.5400	26.9449	27.2311	27.5303
Average = Sum(39)m / 12 =	66.1562	65.9919	65.8309	65.0748	64.9333	64.2748	64.2748	64.1528	64.5284	64.9333	65.2195	65.0741
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0944	1.0917	1.0890	1.0765	1.0742	1.0633	1.0633	1.0613	1.0675	1.0742	1.0789	1.0839
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.9943 (42)
Hot water usage for mixer showers												57.4370 (42a)
Hot water usage for baths												24.8338 (42b)
Hot water usage for other uses												35.0539 (42c)
Average daily hot water use (litres/day)												108.1288 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	117.6298	115.1186	112.0601	107.4088	103.6317	99.5711	98.0100	101.0553	104.2671	108.5301	113.2532	117.3247 (44)
Energy content (annual)	186.2969	163.9274	172.2323	147.0372	139.5082	122.4342	118.5347	125.1276	128.5717	147.2744	161.3500	183.7021 (45)
Distribution loss (46)m = 0.15 x (45)m												1795.9966
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
If cylinder contains dedicated solar storage												23.3325 (56)
Primary loss												23.3325 (57)
Combi loss												23.2624 (59)
Total heat required for water heating calculated for each month												0.0000 (61)
WWHRS												232.8918 (62)
PV diverter												-26.3588 (63a)
Solar input												-0.0000 (63b)
FGHRS												0.0000 (63c)
Output from w/h												0.0000 (63d)
12Total per year (kWh/year)												206.5330 (64)
Electric shower(s)												182.7012 (64)
Heat gains from water heating, kWh/month												194.4163 (64)
												171.9159 (64)
												167.2652 (64)
												151.4063 (64)
												150.0198 (64)
												155.6548 (64)
												156.9854 (64)
												174.2076 (64)
												184.1675 (64)
												204.4264 (64)
												2099.6992 (64)
												2100 (64)
												0.0000 (64a)
												0.0000 (64a)
												99.2197 (65)
												88.1744 (65)
												94.5432 (65)
												84.9633 (65)
												83.6624 (65)
												76.7829 (65)
												76.6887 (65)
												78.8808 (65)
												78.8236 (65)
												86.2446 (65)
												89.7223 (65)
												98.3569 (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	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164	99.7164 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	89.3894	98.9668	89.3894	92.3690	89.3894	92.3690	89.3894	89.3894	92.3690	89.3894	92.3690	89.3894 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	174.0804	175.8868	171.3347	161.6438	149.4109	137.9136	130.2327	128.4263	132.9784	142.6693	154.9022	166.3995 (68)
Pumps, fans	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716	32.9716 (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)	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732	-79.7732 (71)
Total internal gains	133.3597	131.2119	127.0741	118.0046	112.4495	106.6429	103.0762	106.0226	109.4772	115.9202	124.6144	132.2001 (72)
	452.7445	461.9805	443.7132	427.9324	407.1646	389.8404	375.6132	376.7532	387.7395	403.8938	427.8005	443.9039 (73)

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

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North	7.0400		10.6334		0.6300		0.7000		0.7700		22.8779 (74)	
East	4.0700		19.6403		0.6300		0.7000		0.7700		24.4294 (76)	
Solar gains	47.3073	91.5100	152.9944	234.1148	301.4218	316.0904	297.7622	245.2315	180.8572	108.7498	58.6835	39.1617 (83)
Total gains	500.0518	553.4905	596.7075	662.0472	708.5865	705.9308	673.3754	621.9847	568.5967	512.6436	486.4840	483.0657 (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	52.9403	53.0720	53.2018	53.8200	53.9372	54.4899	54.4899	54.5935	54.2757	53.9372	53.7006	53.4553
alpha	4.5294	4.5381	4.5468	4.5880	4.5958	4.6327	4.6327	4.6396	4.6184	4.5958	4.5800	4.5637
util living area	0.9847	0.9745	0.9522	0.8842	0.7501	0.5618	0.4156	0.4665	0.7095	0.9136	0.9724	0.9868 (86)
MIT	19.7356	19.9193	20.2014	20.5813	20.8499	20.9693	20.9938	20.9897	20.9132	20.5709	20.1020	19.7087 (87)
Th 2	20.0054	20.0076	20.0098	20.0201	20.0220	20.0309	20.0309	20.0326	20.0275	20.0220	20.0181	20.0140 (88)
util rest of house	0.9808	0.9680	0.9398	0.8555	0.6959	0.4847	0.3262	0.3722	0.6331	0.8855	0.9642	0.9834 (89)
MIT 2	18.5520	18.7850	19.1383	19.6019	19.8961	20.0126	20.0287	20.0285	19.9676	19.6020	19.0254	18.5242 (90)
Living area fraction	19.0722	19.2836	19.6056	20.0324	20.3154	20.4331	20.4529	20.4510	20.3832	20.0279	19.4986	19.0448 (92)
MIT	19.0722	19.2836	19.6056	20.0324	20.3154	20.4331	20.4529	20.4510	20.3832	20.0279	19.4986	19.0448 (93)
Temperature adjustment												0.0000
adjusted MIT	19.0722	19.2836	19.6056	20.0324	20.3154	20.4331	20.4529	20.4510	20.3832	20.0279	19.4986	19.0448 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9759	0.9620	0.9338	0.8559	0.7130	0.5174	0.3655	0.4136	0.6626	0.8857	0.9587	0.9789 (94)
Useful gains	488.0156	532.4742	557.1760	566.6615	505.2494	365.2749	246.1180	257.2236	376.7534	454.0660	466.3972	472.8859 (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	977.2751	949.2002	862.7515	724.4376	559.4241	374.9206	247.6445	259.8818	405.4458	612.1840	808.6307	972.6130 (97)
Space heating kWh	364.0090	280.0398	227.3482	113.5988	40.3060	0.0000	0.0000	0.0000	0.0000	117.6398	246.4081	371.7970 (98a)
Space heating requirement - total per year (kWh/year)												1761.1467
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	364.0090	280.0398	227.3482	113.5988	40.3060	0.0000	0.0000	0.0000	0.0000	117.6398	246.4081	371.7970 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1761.1467
Space heating per m2										(98c) / (4) =		29.1339 (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	364.0090	280.0398	227.3482	113.5988	40.3060	0.0000	0.0000	0.0000	0.0000	117.6398	246.4081	371.7970 (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)	394.3760	303.4018	246.3144	123.0756	43.6685	0.0000	0.0000	0.0000	0.0000	127.4537	266.9644	402.8136 (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	206.5330	182.7012	194.4163	171.9159	167.2652	151.4063	150.0198	155.6548	156.9854	174.2076	184.1675	204.4264 (64)
Efficiency of water heater (217)m	85.3168	85.0144	84.4116	83.1532	81.4020	79.8000	79.8000	79.8000	79.8000	83.1990	84.7135	79.8000 (216)
Fuel for water heating, kWh/month	242.0778	214.9061	230.3193	206.7460	205.4804	189.7322	187.9948	195.0561	196.7235	209.3867	217.4005	239.4209 (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	18.5733	14.9002	13.4160	9.8291	7.5923	6.2030	6.9260	9.0026	11.6935	15.3425	17.3293	19.0896 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-16.2835	-24.1718	-36.5663	-43.3478	-48.7209	-46.2151	-45.6646	-42.1315	-36.2387	-28.6234	-18.3326	-13.9408 (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	-5.8442	-12.5674	-25.4916	-39.0460	-52.3718	-52.8826	-52.2476	-43.8856	-31.7159	-18.2053	-7.8779	-4.6005 (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												1908.0679 (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												2535.2444 (219)

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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)	149.8975 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-746.9732 (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	3932.2367 (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	1908.0679	0.2100	400.6943 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2535.2444	0.2100	532.4013 (264)
Space and water heating			933.0956 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	149.8975	0.1443	21.6348 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-400.2369	0.1335	-53.4340
PV Unit electricity exported	-346.7362	0.1253	-43.4567
Total			-96.8907 (269)
Total CO2, kg/year			869.7690 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.3900 (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	1908.0679	1.1300	2156.1167 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2535.2444	1.1300	2864.8262 (278)
Space and water heating			5020.9429 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	149.8975	1.5338	229.9178 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-400.2369	1.4934	-597.6954
PV Unit electricity exported	-346.7362	0.4600	-159.5068
Total			-757.2022 (283)
Total Primary energy kWh/year			4623.7594 (286)
Target Primary Energy Rate (TPER)			76.4900 (287)

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Property Reference	Be Green			Issued on Date	06/01/2025
Assessment Reference	GF-Unit 1 (Block B)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	84 B	DER	5.27	TER	15.33
Environmental	97 A	% DER < TER			65.62
CO ₂ Emissions (t/year)	0.19	DFEE	24.10	TFEE	27.98
Compliance Check	See BREL	% DFEE < TFEE			13.87
% DPER < TPER	31.72	DPER	56.08	TPER	82.13
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	38.5900 (1b)	2.5000 (2b)	96.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.5900		96.4750 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	96.4750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.2073 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.3573 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3037 (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	0.3872	0.3796	0.3720	0.3341	0.3265	0.2885	0.2885	0.2809	0.3037	0.3265	0.3417	0.3569 (22b)
Effective ac	0.5750	0.5721	0.5692	0.5558	0.5533	0.5416	0.5416	0.5395	0.5461	0.5533	0.5584	0.5637 (25)

3. Heat losses and heat loss parameter

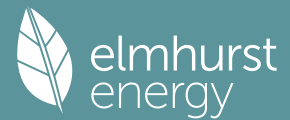
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.00)			6.1600	0.9615	5.9231		(27)
Heatloss Floor			38.5900	0.1000	3.8590	110.0000	4244.9000 (28a)
External Wall	34.7500	6.1600	28.5900	0.1300	3.7167	70.0000	2001.3000 (29a)
Total net area of external elements A _{um} (A, m ²)			73.3400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		13.4988		(33)
Party Wall			34.7500	0.0000	0.0000	180.0000	6255.0000 (32)
Party Ceiling			38.5900			30.0000	1157.7000 (32b)
Internal Wall			66.3000			9.0000	596.7000 (32c)

Heat capacity C_m = Sum(A x k)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 14255.6000 (34)
369.4118 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	3.7500	0.3000	1.1250
E3 Sill	2.8000	0.0400	0.1120
E4 Jamb	13.0000	0.0500	0.6500
E5 Ground floor (normal)	13.9000	0.1600	2.2240
E7 Party floor between dwellings (in blocks of flats)	13.9000	0.0700	0.9730
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	5.0000	0.0600	0.3000

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P1 Party wall - Ground floor	13.9000	0.1600	2.2240	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.9000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.8330 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =		21.3318 (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	18.3053	18.2126	18.1218	17.6950	17.6152	17.2435	17.2435	17.1747	17.3867	17.6152	17.7767	17.9456 (38)
Average = Sum(39)m / 12 =	39.6371	39.5444	39.4536	39.0268	38.9470	38.5753	38.5753	38.5065	38.7185	38.9470	39.1085	39.2774 (39)
												39.0264
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0271	1.0247	1.0224	1.0113	1.0093	0.9996	0.9996	0.9978	1.0033	1.0093	1.0134	1.0178 (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												1.3694 (42)
Hot water usage for mixer showers	53.0769	52.2793	51.1169	48.8931	47.2519	45.4217	44.3814	45.5349	46.7994	48.7645	51.0361	52.8736 (42a)
Hot water usage for baths	20.4120	20.1088	19.6819	18.8948	18.3054	17.6519	17.2989	17.7228	18.1843	18.8836	19.6870	20.3429 (42b)
Hot water usage for other uses	28.6539	27.6119	26.5700	25.5280	24.4860	23.4441	23.4441	24.4860	25.5280	26.5700	27.6119	28.6539 (42c)
Average daily hot water use (litres/day)												93.9092 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	102.1427	100.0000	97.3688	93.3159	90.0433	86.5176	85.1243	87.7437	90.5117	94.2181	98.3350	101.8704 (44)
Distribution loss (46)m = 0.15 x (45)m	161.7691	142.3987	149.6523	127.7447	121.2156	106.3835	102.9505	108.6450	111.6100	127.8530	140.0963	159.5044 (45)
Water storage loss:	Total = Sum(45)m = 1559.8231											
Store volume	24.2654	21.3598	22.4478	19.1617	18.1823	15.9575	15.4426	16.2968	16.7415	19.1780	21.0144	23.9257 (46)
a) If manufacturer declared loss factor is known (kWh/day):	150.0000 (47)											
Temperature factor from Table 2b	1.2960 (48)											
Enter (49) or (54) in (55)	0.5400 (49)											
Total storage loss	0.6998 (55)											
If cylinder contains dedicated solar storage	21.6950	19.5955	21.6950	20.9952	21.6950	20.9952	21.6950	21.6950	20.9952	21.6950	20.9952	21.6950 (56)
Primary loss	21.6950	19.5955	21.6950	20.9952	21.6950	20.9952	21.6950	21.6950	20.9952	21.6950	20.9952	21.6950 (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	206.7266	183.0054	194.6097	171.2519	166.1731	149.8907	147.9079	153.6025	155.1172	172.8105	183.6035	204.4618 (62)
PV diverter	-23.7304	-20.9873	-21.9767	-18.1976	-16.9595	-14.5124	-13.6030	-14.4655	-15.0151	-17.7011	-20.0532	-23.2909 (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)
12Total per year (kWh/year)	182.9962	162.0181	172.6330	153.0544	149.2136	135.3783	134.3049	139.1370	140.1021	155.1094	163.5503	181.1709 (64)
Electric shower(s)	Total per year (kWh/year) = Sum(64)m = 1868.6681 (64)											
	1869 (64)											
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)											
Heat gains from water heating, kWh/month												
	89.7542	79.8329	85.7253	77.2809	76.2702	70.1783	70.1970	72.0904	71.9161	78.4771	81.3878	89.0012 (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	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	63.8861	70.7310	63.8861	66.0156	63.8861	66.0156	63.8861	63.8861	66.0156	63.8861	66.0156	63.8861 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	118.0043	119.2288	116.1431	109.5739	101.2815	93.4878	88.2812	87.0566	90.1424	96.7116	105.0040	112.7976 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469 (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)	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754 (71)
Water heating gains (Table 5)	120.6374	118.7990	115.2222	107.3346	102.5136	97.4698	94.3508	96.8957	99.8834	105.4800	113.0386	119.6252 (72)
Total internal gains	346.0685	352.2996	338.7921	326.4648	311.2220	300.5140	290.0588	291.3792	299.5822	309.6183	327.5989	339.8497 (73)

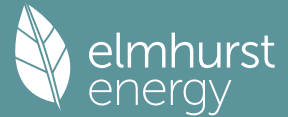
6. Solar gains

[Jan]												Gains
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	W
South				6.1600	46.7521		0.5700		0.7000		0.7700	79.6320 (78)
Solar gains	79.6320	130.4167	166.1277	187.7604	195.6580	188.2942	183.9749	178.6651	173.5400	140.6666	94.3911	68.8094 (83)
Total gains	425.7005	482.7163	504.9199	514.2253	506.8800	488.8082	474.0336	470.0443	473.1222	450.2850	421.9900	408.6591 (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)	

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	99.9036	100.1378	100.3684	101.4658	101.6738	102.6535	102.6535	102.8369	102.2739	101.6738	101.2539	100.8186
alpha	7.6602	7.6759	7.6912	7.7644	7.7783	7.8436	7.8436	7.8558	7.8183	7.7783	7.7503	7.7212
util living area	0.9876	0.9682	0.9322	0.8448	0.6988	0.5039	0.3580	0.3767	0.5618	0.8340	0.9647	0.9904 (86)
Living	20.5881	20.6991	20.8035	20.9016	20.9477	20.9594	20.9603	20.9603	20.9581	20.9145	20.7496	20.5670
Non living	19.6014	19.7386	19.8624	19.9748	20.0167	20.0324	20.0327	20.0343	20.0286	19.9904	19.8099	19.5820
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	20.7893	20.6991	20.8035	20.9016	20.9477	20.9594	20.9603	20.9603	20.9581	20.9145	20.7496	20.6276 (87)
Th 2	20.0608	20.0628	20.0647	20.0739	20.0756	20.0837	20.0837	20.0851	20.0806	20.0756	20.0722	20.0685 (88)
util rest of house	0.9825	0.9565	0.9090	0.8011	0.6360	0.4324	0.2835	0.3019	0.4885	0.7815	0.9496	0.9864 (89)
MIT 2	19.8776	19.7386	19.8624	19.9748	20.0167	20.0324	20.0327	20.0343	20.0286	19.9904	19.8099	19.6696 (90)
Living area fraction									fLA = Living area / (4) =			0.4185 (91)
MIT	20.2592	20.1406	20.2562	20.3627	20.4063	20.4204	20.4209	20.4218	20.4176	20.3771	20.2032	20.0705 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2592	20.1406	20.2562	20.3627	20.4063	20.4204	20.4209	20.4218	20.4176	20.3771	20.2032	20.0705 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9837	0.9576	0.9142	0.8156	0.6590	0.4588	0.3109	0.3294	0.5156	0.7997	0.9521	0.9864 (94)
Useful gains	418.7762	462.2439	461.6168	419.3791	334.0136	224.2504	147.3818	154.8493	243.9261	360.0810	401.7573	403.1173 (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	632.5747	602.6807	542.7327	447.3522	339.0840	224.5223	147.3924	154.8662	244.6081	380.7893	512.4461	623.3528 (97)
Space heating kWh	159.0661	94.3735	60.3502	20.1406	3.7724	0.0000	0.0000	0.0000	0.0000	15.4070	79.6959	163.8552 (98a)
Space heating requirement - total per year (kWh/year)												596.6610
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	159.0661	94.3735	60.3502	20.1406	3.7724	0.0000	0.0000	0.0000	0.0000	15.4070	79.6959	163.8552 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												596.6610
Space heating per m2										(98c) / (4) =		15.4615 (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 %)												232.9815 (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	159.0661	94.3735	60.3502	20.1406	3.7724	0.0000	0.0000	0.0000	0.0000	15.4070	79.6959	163.8552 (98)
Space heating efficiency (main heating system 1)	232.9815	232.9815	232.9815	232.9815	232.9815	0.0000	0.0000	0.0000	0.0000	232.9815	232.9815	232.9815 (210)
Space heating fuel (main heating system)	68.2741	40.5069	25.9034	8.6447	1.6192	0.0000	0.0000	0.0000	0.0000	6.6130	34.2070	70.3297 (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	182.9962	162.0181	172.6330	153.0544	149.2136	135.3783	134.3049	139.1370	140.1021	155.1094	163.5503	181.1709 (64)
Efficiency of water heater (217)m	177.8844	177.8844	177.8844	177.8844	177.8844	177.8844	177.8844	177.8844	177.8844	177.8844	177.8844	177.8844 (216)
Fuel for water heating, kWh/month	102.8737	91.0805	97.0478	86.0415	83.8823	76.1047	75.5012	78.2177	78.7602	87.1967	91.9419	101.8476 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	13.0029	10.4314	9.3924	6.8812	5.3153	4.3426	4.8488	6.3026	8.1865	10.7411	12.1320	13.3643 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												256.0980 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												177.8844
Water heating fuel used												1050.4958 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												104.9412 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)

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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	1411.5350 (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	256.0980	0.1583	40.5513 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1050.4958	0.1407	147.7915 (264)
Space and water heating			188.3428 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	104.9412	0.1443	15.1463 (268)
Total CO2, kg/year			203.4890 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.2700 (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	256.0980	1.5861	406.2026 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1050.4958	1.5202	1596.9639 (278)
Space and water heating			2003.1665 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	104.9412	1.5338	160.9623 (282)
Total Primary energy kWh/year			2164.1288 (286)
Dwelling Primary energy Rate (DPER)			56.0800 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	38.5900 (1b)	x 2.5000 (2b)	= 96.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.5900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 96.4750 (5)

2. Ventilation rate

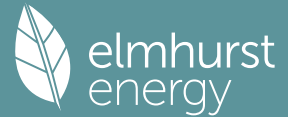
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.2073 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4573 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3887 (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	3.7000	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	0.4956	0.4859	0.4762	0.4276	0.4179	0.3693	0.3693	0.3596	0.3887	0.4179	0.4373	0.4567 (22b)
Effective ac	0.6228	0.6180	0.6134	0.5914	0.5873	0.5682	0.5682	0.5646	0.5755	0.5873	0.5956	0.6043 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			6.1600	1.1450	7.0534		(27)
Heatloss Floor			38.5900	0.1300	5.0167		(28a)
External Wall	34.7500	6.1600	28.5900	0.1800	5.1462		(29a)
Total net area of external elements Aum(A, m2)			73.3400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.2163		(33)
Party Wall			34.7500	0.0000	0.0000		(32)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											379.4118 (35)
List of Thermal Bridges											
K1 Element							Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)							3.7500	0.0500		0.1875	
E3 Sill							2.8000	0.0500		0.1400	
E4 Jamb							13.0000	0.0500		0.6500	
E5 Ground floor (normal)							13.9000	0.1600		2.2240	
E7 Party floor between dwellings (in blocks of flats)							13.9000	0.0700		0.9730	
E16 Corner (normal)							2.5000	0.0900		0.2250	
E18 Party wall between dwellings							5.0000	0.0600		0.3000	
P1 Party wall - Ground floor							13.9000	0.0800		1.1120	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)							13.9000	0.0000		0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)										5.8115 (36)	
Point Thermal bridges										0.0000	
Total fabric heat loss										(33) + (36) + (36a) =	23.0278 (37)

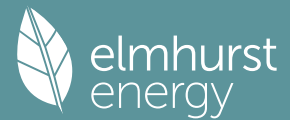
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	19.8283	19.6765	19.5277	18.8287	18.6979	18.0891	18.0891	17.9763	18.3236	18.6979	18.9625	19.2391 (38)
Average = Sum(39)m / 12 =	42.8562	42.7044	42.5555	41.8565	41.7257	41.1169	41.1169	41.0042	41.3514	41.7257	41.9903	42.2669 (39)
												41.8559
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1106	1.1066	1.1028	1.0846	1.0813	1.0655	1.0655	1.0626	1.0716	1.0813	1.0881	1.0953 (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												1.3694 (42)
Hot water usage for mixer showers	47.1795	46.4705	45.4373	43.4605	42.0017	40.3748	39.4501	40.4754	41.5994	43.3462	45.3654	46.9987 (42a)
Hot water usage for baths	20.4120	20.1088	19.6819	18.8948	18.3054	17.6519	17.2989	17.7228	18.1843	18.8836	19.6870	20.3429 (42b)
Hot water usage for other uses	28.6539	27.6119	26.5700	25.5280	24.4860	23.4441	23.4441	24.4860	25.5280	26.5700	27.6119	28.6539 (42c)
Average daily hot water use (litres/day)												88.4720 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.2453	94.1912	91.6892	87.8833	84.7931	81.4708	80.1931	82.6843	85.3118	88.7998	92.6643	95.9955 (44)
Energy content (annual)	152.4290	134.1270	140.9228	120.3078	114.1478	100.1778	96.9865	102.3804	105.1979	120.5005	132.0173	150.3058 (45)
Distribution loss (46)m = 0.15 x (45)m	22.8644	20.1190	21.1384	18.0462	17.1222	15.0267	14.5480	15.3571	15.7797	18.0751	19.8026	22.5459 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	199.0239	176.2127	187.5177	165.3997	160.7427	145.2697	143.5814	148.9753	150.2898	167.0954	177.1092	196.9007 (62)
WWHRS	-21.5685	-19.0753	-19.9746	-16.5398	-15.4145	-13.1903	-12.3638	-13.1476	-13.6472	-16.0885	-18.2263	-21.1691 (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	177.4555	157.1374	167.5431	148.8599	145.3283	132.0794	131.2177	135.8277	136.6426	151.0069	158.8829	175.7316 (64)
12Total per year (kWh/year)												1817.7129 (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	87.9586	78.2658	84.1328	76.0758	75.2301	69.3826	69.5239	71.3174	71.0518	77.3423	79.9692	87.2526 (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	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693	68.4693 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	62.1243	68.7804	62.1243	64.1951	62.1243	64.1951	62.1243	62.1243	64.1951	62.1243	64.1951	62.1243 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	118.0043	119.2288	116.1431	109.5739	101.2815	93.4878	88.2812	87.0566	90.1424	96.7116	105.0040	112.7976 (68)
Pumps, fans	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469	29.8469 (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)	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754	-54.7754 (71)
Total internal gains	118.2239	116.4670	113.0817	105.6609	101.1157	96.3647	93.4462	95.8567	98.6830	103.9547	111.0684	117.2750 (72)
	344.8933	351.0170	337.8898	325.9706	311.0623	297.5884	287.3924	288.5784	296.5613	309.3314	326.8082	338.7377 (73)

6. Solar gains							
[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	Specific data	Specific data	factor	W
			W/m2	or Table 6b	or Table 6c	Table 6d	
South		6.1600	46.7521	0.6300	0.7000	0.7700	88.0143 (78)

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Solar gains	88.0143	144.1448	183.6149	207.5247	216.2535	208.1146	203.3406	197.4719	191.8074	155.4737	104.3270	76.0525 (83)
Total gains	432.9076	495.1618	521.5047	533.4953	527.3158	505.7030	490.7330	486.0504	488.3687	464.8050	431.1352	414.7902 (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	94.9007	95.2381	95.5712	97.1673	97.4718	98.9151	98.9151	99.1871	98.3541	97.4718	96.8577	96.2238
alpha	7.3267	7.3492	7.3714	7.4778	7.4981	7.5943	7.5943	7.6125	7.5569	7.4981	7.4572	7.4149
util living area	0.9899	0.9732	0.9407	0.8579	0.7148	0.5186	0.3685	0.3879	0.5800	0.8499	0.9704	0.9922 (86)
MIT	20.4311	20.5923	20.7492	20.9030	20.9779	20.9982	20.9999	20.9998	20.9959	20.9226	20.6716	20.4073 (87)
Th 2	19.9922	19.9954	19.9986	20.0134	20.0162	20.0291	20.0291	20.0315	20.0241	20.0162	20.0106	20.0047 (88)
util rest of house	0.9855	0.9625	0.9186	0.8136	0.6480	0.4409	0.2873	0.3063	0.5002	0.7965	0.9567	0.9887 (89)
MIT 2	19.3671	19.5680	19.7558	19.9340	20.0026	20.0285	20.0291	20.0315	20.0224	19.9583	19.6799	19.3477 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.8124	19.9967	20.1715	20.3395	20.4108	20.4343	20.4354	20.4367	20.4298	20.3619	20.0949	19.7912 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.8124	19.9967	20.1715	20.3395	20.4108	20.4343	20.4354	20.4367	20.4298	20.3619	20.0949	19.7912 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9845	0.9625	0.9229	0.8292	0.6755	0.4735	0.3213	0.3405	0.5337	0.8166	0.9581	0.9878 (94)
Useful gains	426.2021	476.5971	481.2814	442.3923	356.2225	239.4512	157.6796	165.4934	260.6517	379.5596	413.0496	409.7221 (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	664.8012	644.6934	581.7983	478.8193	363.4646	239.8894	157.6989	165.5234	261.7472	407.3208	545.6610	658.9904 (97)
Space heating kWh	177.5177	112.9607	74.7846	26.2274	5.3881	0.0000	0.0000	0.0000	0.0000	20.6543	95.4801	185.4556 (98a)
Space heating requirement - total per year (kWh/year)	698.4686											
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	177.5177	112.9607	74.7846	26.2274	5.3881	0.0000	0.0000	0.0000	0.0000	20.6543	95.4801	185.4556 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	698.4686											
Space heating per m2	(98c) / (4) = 18.0997 (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	177.5177	112.9607	74.7846	26.2274	5.3881	0.0000	0.0000	0.0000	0.0000	20.6543	95.4801	185.4556 (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)	192.3269	122.3843	81.0234	28.4154	5.8376	0.0000	0.0000	0.0000	0.0000	22.3774	103.4454	200.9269 (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	177.4555	157.1374	167.5431	148.8599	145.3283	132.0794	131.2177	135.8277	136.6426	151.0069	158.8829	175.7316 (64)
Efficiency of water heater	84.0606	83.3322	82.3766	81.0302	80.0902	79.8000	79.8000	79.8000	79.8000	80.7851	82.9560	79.8000 (216)
Fuel for water heating, kWh/month	211.1043	188.5673	203.3869	183.7092	181.4558	165.5130	164.4332	170.2101	171.2314	186.9241	191.5267	208.7551 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	12.9082	10.3554	9.3239	6.8311	5.2765	4.3110	4.8134	6.2567	8.1268	10.6628	12.0436	13.2670 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-10.5548	-15.7548	-23.9707	-28.5982	-32.3234	-30.7512	-30.4102	-27.9837	-23.9430	-18.7573	-11.9212	-9.0284 (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)	-3.5710	-7.6987	-15.6457	-24.0003	-32.2120	-32.5107	-32.0949	-26.9277	-19.4378	-11.1372	-4.8110	-2.8079 (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	756.7373 (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	2226.8169 (219)											
Space cooling fuel	0.0000 (221)											
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												86.0000 (231)

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Electricity for lighting (calculated in Appendix L)	104.1765 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-476.8519 (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	2696.8790 (238)

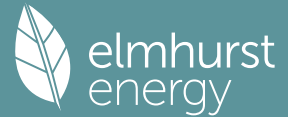
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	756.7373	0.2100	158.9148 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2226.8169	0.2100	467.6316 (264)
Space and water heating			626.5464 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	104.1765	0.1443	15.0359 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-263.9969	0.1334	-35.2086
PV Unit electricity exported	-212.8549	0.1253	-26.6725
Total			-61.8811 (269)
Total CO2, kg/year			591.6305 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.3300 (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	756.7373	1.1300	855.1132 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2226.8169	1.1300	2516.3032 (278)
Space and water heating			3371.4164 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	104.1765	1.5338	159.7895 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-263.9969	1.4928	-394.1034
PV Unit electricity exported	-212.8549	0.4599	-97.9010
Total			-492.0044 (283)
Total Primary energy kWh/year			3169.3022 (286)
Target Primary Energy Rate (TPER)			82.1300 (287)

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Property Reference	Be Green			Issued on Date	06/01/2025
Assessment Reference	GF-Unit 4 (Block A) (Boiler)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	91 B	DER	13.73	TER	13.88
Environmental	90 B	% DER < TER			1.08
CO ₂ Emissions (t/year)	0.86	DFEE	29.54	TFEE	34.51
Compliance Check	See BREL	% DFEE < TFEE			14.42
% DPER < TPER	6.54	DPER	68.91	TPER	73.73
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	67.1100 (1b)	2.5000 (2b)	167.7750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.1100		167.7750 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	167.7750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1192 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2692 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2288 (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	0.2918	0.2860	0.2803	0.2517	0.2460	0.2174	0.2174	0.2117	0.2288	0.2460	0.2574	0.2689 (22b)
Effective ac	0.5426	0.5409	0.5393	0.5317	0.5303	0.5236	0.5236	0.5224	0.5262	0.5303	0.5331	0.5361 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.00)			10.5600	0.9615	10.1538		(27)
Heatloss Floor			67.1100	0.1000	6.7110	110.0000	7382.1000 (28a)
External Wall	67.1100	10.5600	56.5500	0.1300	7.3515	70.0000	3958.5000 (29a)
Total net area of external elements A _{um} (A, m ²)			134.2200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2163		(33)
Party Wall			42.4500	0.0000	0.0000	180.0000	7641.0000 (32)
Party Ceiling			67.1100			30.0000	2013.3000 (32b)
Internal Wall			112.8500			9.0000	1015.6500 (32c)

Heat capacity C_m = Sum(A x k)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 22010.5500 (34)
327.9772 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.7500	0.3000	1.7250
E3 Sill	4.8000	0.0400	0.1920
E4 Jamb	21.8000	0.0500	1.0900
E5 Ground floor (normal)	16.9900	0.1600	2.7184
E7 Party floor between dwellings (in blocks of flats)	16.9900	0.0700	1.1893
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	5.0000	0.0600	0.3000

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P1 Party wall - Ground floor	16.9900	0.1600	2.7184
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.9900	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.1581 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	34.3744 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	30.0392	29.9477	29.8581	29.4368	29.3580	28.9911	28.9911	28.9231	29.1324	29.3580	29.5174	29.6841 (38)
Average = Sum(39)m / 12 =	64.4137	64.3222	64.2325	63.8112	63.7324	63.3655	63.3655	63.2976	63.5068	63.7324	63.8919	64.0586 (39)
												63.8109
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9598	0.9585	0.9571	0.9508	0.9497	0.9442	0.9442	0.9432	0.9463	0.9497	0.9520	0.9545 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1740 (42)
Hot water usage for mixer showers												
Hot water usage for baths	68.2537	67.2280	65.7333	62.8735	60.7631	58.4095	57.0717	58.5551	60.1812	62.7082	65.6294	67.9922 (42a)
Hot water usage for other uses	26.2133	25.8240	25.2758	24.2649	23.5081	22.6688	22.2154	22.7598	23.3526	24.2506	25.2823	26.1247 (42b)
Average daily hot water use (litres/day)	36.8936	35.5520	34.2105	32.8689	31.5273	30.1857	30.1857	31.5273	32.8689	34.2105	35.5520	36.8936 (42c)
												120.7712 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	131.3606	128.6040	125.2195	120.0073	115.7984	111.2640	109.4729	112.8422	116.4026	121.1692	126.4637	131.0105 (44)
Energy content (annual)	208.0432	183.1304	192.4578	164.2841	155.8869	136.8121	132.3980	139.7223	143.5360	164.4255	180.1707	205.1308 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	31.2065	27.4696	28.8687	24.6426	23.3830	20.5218	19.8597	20.9583	21.5304	24.6638	27.0256	30.7696 (46)
Total storage loss												
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	28.4012	25.6448	28.3521	27.3211	28.1604	27.1746	28.0210	28.0563	27.1912	28.1822	27.3823	28.3846 (59)
Total heat required for water heating calculated for each month												
WWHRS	236.4444	208.7752	220.8099	191.6052	184.0474	163.9867	160.4190	167.7786	170.7272	192.6077	207.5530	233.5154 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
12Total per year (kWh/year)												
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month												
	76.2747	67.3021	71.0802	61.4547	58.8725	52.2837	51.0276	53.4717	54.5235	61.7170	66.7523	75.3021 (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	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	103.4362	114.5186	103.4362	106.8840	103.4362	106.8840	103.4362	103.4362	106.8840	103.4362	106.8840	103.4362 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	190.4603	192.4366	187.4562	176.8535	163.4695	150.8904	142.4868	140.5104	145.4908	156.0935	169.4775	182.0566 (68)
Pumps, fans	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699 (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)	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588 (71)
Total internal gains	102.5197	100.1519	95.5380	85.3538	79.1297	72.6162	68.5854	71.8706	75.7271	82.9530	92.7116	101.2126 (72)
	455.0257	465.7167	445.0399	427.7009	404.6449	386.0002	370.1179	371.4267	383.7115	401.0923	427.6827	445.3149 (73)

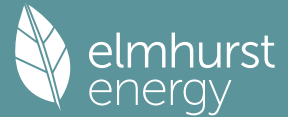
6. Solar gains

[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				3.5200	10.6334		0.5700		0.7000		0.7700		10.3495 (74)
West				7.0400	19.6403		0.5700		0.7000		0.7700		38.2319 (80)
Solar gains	48.5814	94.5682	156.7765	233.6171	292.8685	303.2101	287.2349	241.9616	183.6578	112.2880	60.4382		40.0679 (83)
Total gains	503.6071	560.2849	601.8164	661.3180	697.5134	689.2103	657.3529	613.3883	567.3693	513.3803	488.1209		485.3829 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	94.9184	95.0534	95.1861	95.8145	95.9330	96.4885	96.4885	96.5921	96.2738	95.9330	95.6936	95.4446
	7.3279	7.3369	7.3457	7.3876	7.3955	7.4326	7.4326	7.4395	7.4183	7.3955	7.3796	7.3630

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util living area	0.9980	0.9949	0.9853	0.9372	0.7984	0.5837	0.4237	0.4737	0.7431	0.9614	0.9945	0.9984 (86)
MIT	20.3910	20.4848	20.6230	20.8071	20.9224	20.9549	20.9579	20.9576	20.9417	20.7904	20.5594	20.3725 (87)
Th 2	20.1169	20.1181	20.1192	20.1245	20.1255	20.1301	20.1301	20.1309	20.1283	20.1255	20.1235	20.1214 (88)
util rest of house												
MIT 2	0.9971	0.9928	0.9791	0.9128	0.7410	0.5068	0.3402	0.3848	0.6625	0.9408	0.9918	0.9978 (89)
Living area fraction	19.4071	19.5275	19.7025	19.9275	20.0460	20.0749	20.0763	20.0771	20.0656	19.9139	19.6275	19.3873 (90)
MIT	19.7474	19.8586	20.0209	20.2317	20.3491	20.3793	20.3812	20.3816	20.3686	20.2170	19.9498	19.7280 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7474	19.8586	20.0209	20.2317	20.3491	20.3793	20.3812	20.3816	20.3686	20.2170	19.9498	19.7280 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9966	0.9920	0.9782	0.9162	0.7565	0.5291	0.3644	0.4106	0.6857	0.9434	0.9911	0.9974	(94)
Useful gains	501.9087	555.8073	588.7139	605.9116	527.6887	364.6380	239.5138	251.8293	389.0669	484.3380	483.7992	484.1179	(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	995.0232	962.1710	868.4789	723.0889	551.2284	366.2066	239.5979	252.0279	398.0993	612.9163	820.9974	994.7031	(97)
Space heating kWh	366.8772	273.0765	208.1452	84.3676	17.5136	0.0000	0.0000	0.0000	0.0000	95.6623	242.7827	379.8754	(98a)
Space heating requirement - total per year (kWh/year)												1668.3004	
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	366.8772	273.0765	208.1452	84.3676	17.5136	0.0000	0.0000	0.0000	0.0000	95.6623	242.7827	379.8754	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1668.3004	
Space heating per m2										(98c) / (4) =		24.8592	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													83.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	366.8772	273.0765	208.1452	84.3676	17.5136	0.0000	0.0000	0.0000	0.0000	95.6623	242.7827	379.8754	(98)
Space heating efficiency (main heating system 1)	83.4000	83.4000	83.4000	83.4000	83.4000	0.0000	0.0000	0.0000	0.0000	83.4000	83.4000	83.4000	(210)
Space heating fuel (main heating system)	439.9007	327.4298	249.5746	101.1602	20.9995	0.0000	0.0000	0.0000	0.0000	114.7030	291.1064	455.4861	(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	236.4444	208.7752	220.8099	191.6052	184.0474	163.9867	160.4190	167.7786	170.7272	192.6077	207.5530	233.5154	(64)
Efficiency of water heater (217)m	88.3215	88.3132	88.2969	88.2610	88.2173	88.2000	88.2000	88.2000	88.2000	88.2663	88.3077	88.3238	(216)
Fuel for water heating, kWh/month	267.7087	236.4031	250.0765	217.0892	208.6295	185.9259	181.8809	190.2251	193.5683	218.2122	235.0338	264.3857	(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	22.6512	18.1716	16.3615	11.9871	9.2592	7.5649	8.4466	10.9792	14.2608	18.7110	21.1340	23.2807	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-32.1225	-45.4923	-65.7547	-74.2866	-80.3094	-75.0477	-74.1203	-69.8762	-62.3387	-52.1919	-35.3847	-27.7408	(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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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												2000.3602	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												88.2000	
Water heating fuel used												2649.1388	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												182.8078	(232)

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

PV generation													-694.6659 (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													4223.6409 (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	2000.3602	0.2100	420.0756 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2649.1388	0.2100	556.3191 (264)
Space and water heating			976.3948 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	182.8078	0.1443	26.3848 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-694.6659	0.1345	-93.4265
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-93.4265 (269)
Total CO2, kg/year			921.2824 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.7300 (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	2000.3602	1.1300	2260.4070 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2649.1388	1.1300	2993.5269 (278)
Space and water heating			5253.9339 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	182.8078	1.5338	280.3967 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-694.6659	1.4971	-1039.9510
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1039.9510 (283)
Total Primary energy kWh/year			4624.4804 (286)
Dwelling Primary energy Rate (DPER)			68.9100 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	67.1100 (1b)	x 2.5000 (2b)	= 167.7750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.1100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 167.7750 (5)

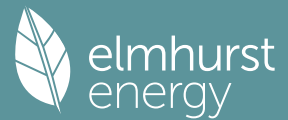
2. Ventilation rate

	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) = 0.1192 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3692 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3138 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.4001 0.3923 0.3844 0.3452 0.3374 0.2981 0.2981 0.2903 0.3138 0.3374 0.3531 0.3687 (22b)
Effective ac	0.5801 0.5769 0.5739 0.5596 0.5569 0.5444 0.5444 0.5421 0.5492 0.5569 0.5623 0.5680 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			10.5600	1.1450	12.0916		(27)
Heatloss Floor			67.1100	0.1300	8.7243		(28a)

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External Wall	67.1100	10.5600	56.5500	0.1800	10.1790	(29a)
Total net area of external elements Aum(A, m ²)			134.2200			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	30.9949		(33)
Party Wall			42.4500	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 337.9772 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.7500	0.0500	0.2875
E3 Sill	4.8000	0.0500	0.2400
E4 Jamb	21.8000	0.0500	1.0900
E5 Ground floor (normal)	16.9900	0.1600	2.7184
E7 Party floor between dwellings (in blocks of flats)	16.9900	0.0700	1.1893
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	5.0000	0.0600	0.3000
P1 Party wall - Ground floor	16.9900	0.0800	1.3592
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.9900	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4094 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.4043 (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	32.1150	31.9429	31.7742	30.9818	30.8336	30.1435	30.1435	30.0157	30.4093	30.8336	31.1335	31.4470	(38)
Heat transfer coeff	70.5193	70.3472	70.1785	69.3861	69.2379	68.5478	68.5478	68.4200	68.8136	69.2379	69.5378	69.8513	(39)
Average = Sum(39)m / 12 =												69.3854	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0508	1.0482	1.0457	1.0339	1.0317	1.0214	1.0214	1.0195	1.0254	1.0317	1.0362	1.0408	(40)
HLP (average)												1.0339	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	(40)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1740 (42)
Hot water usage for mixer showers	60.6700	59.7582	58.4296	55.8876	54.0116	51.9196	50.7304	52.0490	53.4944	55.7406	58.3372	60.4375	(42a)
Hot water usage for baths	26.2133	25.8240	25.2758	24.2649	23.5081	22.6688	22.2154	22.7598	23.3526	24.2506	25.2823	26.1247	(42b)
Hot water usage for other uses	36.8936	35.5520	34.2105	32.8689	31.5273	30.1857	30.1857	31.5273	32.8689	34.2105	35.5520	36.8936	(42c)
Average daily hot water use (litres/day)												113.7792	(43)
Daily hot water use	123.7769	121.1343	117.9158	113.0214	109.0470	104.7740	103.1316	106.3361	109.7158	114.2017	119.1715	123.4558	(44)
Energy conte	196.0324	172.4936	181.2323	154.7206	146.7982	128.8319	124.7287	131.6663	135.2906	154.9706	169.7817	193.3020	(45)
Energy content (annual)										Total = Sum(45)m =		1889.8488	(45)
Distribution loss (46)m = 0.15 x (45)m	29.4049	25.8740	27.1848	23.2081	22.0197	19.3248	18.7093	19.7499	20.2936	23.2456	25.4673	28.9953	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	246.9913	218.5210	232.1912	204.0357	197.7571	178.1470	175.6876	182.6252	184.6056	205.9295	219.0968	244.2609	(62)
WWHRS	-27.7358	-24.5297	-25.6861	-21.2691	-19.8221	-16.9619	-15.8991	-16.9071	-17.5494	-20.6888	-23.4379	-27.2222	(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	219.2555	193.9912	206.5050	182.7666	177.9350	161.1851	159.7886	165.7182	167.0562	185.2407	195.6588	217.0387	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2232.1396	(64)
Electric shower(s)												2232	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	77.9205	68.8610	72.9995	63.7734	61.5501	55.1654	54.2120	56.5188	57.3129	64.2674	68.7812	77.0126	(65)

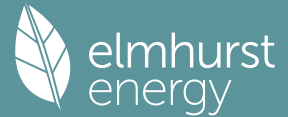
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.5565	111.3304	100.5565	103.9084	100.5565	103.9084	100.5565	100.5565	103.9084	100.5565	103.9084	100.5565	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	190.4603	192.4366	187.4562	176.8535	163.4695	150.8904	142.4868	140.5104	145.4908	156.0935	169.4775	182.0566	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	(71)
Water heating gains (Table 5)	104.7318	102.4717	98.1175	88.5741	82.7287	76.6186	72.8656	75.9661	79.6012	86.3810	95.5294	103.5116	(72)
Total internal gains	454.3581	464.8483	444.7398	427.9456	405.3642	387.0269	371.5184	372.6425	384.6100	401.6405	427.5249	444.7343	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	3.5200	10.6334	0.6300	0.7000	0.7700	11.4390 (74)
West	7.0400	19.6403	0.6300	0.7000	0.7700	42.2563 (80)

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Solar gains	53.6953	104.5228	173.2793	258.2084	323.6967	335.1270	317.4702	267.4313	202.9902	124.1078	66.8001	44.2856 (83)
Total gains	508.0534	569.3710	618.0191	686.1539	729.0609	722.1538	688.9886	640.0738	587.6002	525.7484	494.3250	489.0199 (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	89.3438	89.5623	89.7776	90.8029	90.9973	91.9134	91.9134	92.0851	91.5584	90.9973	90.6048	90.1981
alpha	6.9563	6.9708	6.9852	7.0535	7.0665	7.1276	7.1276	7.1390	7.1039	7.0665	7.0403	7.0132
util living area	0.9984	0.9959	0.9877	0.9452	0.8154	0.6005	0.4371	0.4901	0.7665	0.9683	0.9956	0.9987 (86)
MIT	20.1501	20.2828	20.4835	20.7573	20.9372	20.9936	20.9994	20.9987	20.9690	20.7318	20.3974	20.1303 (87)
Th 2	20.0412	20.0433	20.0454	20.0552	20.0570	20.0655	20.0655	20.0671	20.0622	20.0570	20.0533	20.0494 (88)
util rest of house	0.9976	0.9941	0.9821	0.9219	0.7558	0.5165	0.3447	0.3917	0.6809	0.9496	0.9933	0.9982 (89)
MIT 2	19.0601	19.2309	19.4861	19.8245	20.0120	20.0628	20.0654	20.0668	20.0456	19.8033	19.3855	19.0412 (90)
Living area fraction	19.4371	19.5947	19.8310	20.1471	20.3320	20.3847	20.3884	20.3891	20.3649	20.1244	19.7354	0.3459 (91)
MIT	19.4371	19.5947	19.8310	20.1471	20.3320	20.3847	20.3884	20.3891	20.3649	20.1244	19.7354	19.4179 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4371	19.5947	19.8310	20.1471	20.3320	20.3847	20.3884	20.3891	20.3649	20.1244	19.7354	19.4179 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9970	0.9929	0.9805	0.9245	0.7743	0.5456	0.3767	0.4259	0.7101	0.9513	0.9923	0.9977 (94)
Useful gains	506.5276	565.3339	605.9945	634.3512	564.5473	394.0161	259.5331	272.5768	417.2637	500.1343	490.5187	487.8779 (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	1067.4549	1033.7301	935.5523	780.3920	597.6589	396.5280	259.6875	272.9336	431.1122	659.4523	878.6399	1062.9879 (97)
Space heating kWh	417.3299	314.7622	245.1910	105.1494	24.6350	0.0000	0.0000	0.0000	0.0000	118.5326	279.4473	427.8818 (98a)
Space heating requirement - total per year (kWh/year)												1932.9292
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	417.3299	314.7622	245.1910	105.1494	24.6350	0.0000	0.0000	0.0000	0.0000	118.5326	279.4473	427.8818 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1932.9292
Space heating per m2										(98c) / (4) =		28.8024 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	417.3299	314.7622	245.1910	105.1494	24.6350	0.0000	0.0000	0.0000	0.0000	118.5326	279.4473	427.8818 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	451.6557	340.6518	265.3582	113.7980	26.6613	0.0000	0.0000	0.0000	0.0000	128.2820	302.4321	463.0756 (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	219.2555	193.9912	206.5050	182.7666	177.9350	161.1851	159.7886	165.7182	167.0562	185.2407	195.6588	217.0387 (64)
Efficiency of water heater (217)m	85.7374	85.4120	84.7504	83.2409	81.2559	80.3000	80.3000	80.3000	80.3000	83.4500	85.1447	85.8073 (217)
Fuel for water heating, kWh/month	255.7292	227.1241	243.6627	219.5635	218.9809	200.7286	198.9895	206.3738	208.0401	221.9780	229.7958	252.9374 (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	20.8937	16.7617	15.0920	11.0571	8.5408	6.9779	7.7912	10.1273	13.1543	17.2592	19.4942	21.4744 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.0223	-26.7218	-40.3726	-47.7910	-53.6459	-50.8531	-50.2417	-46.3870	-39.9493	-31.6103	-20.2778	-15.4325 (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	-6.5432	-14.0651	-28.5224	-43.6804	-58.5846	-59.1626	-58.4579	-49.1069	-35.4921	-20.3777	-8.8204	-5.1515 (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												2091.9147 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												80.3000
Water heating fuel used												2683.9036 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

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Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	168.6237 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-829.2700 (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	4201.1721 (238)

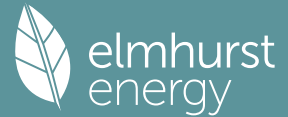
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2091.9147	0.2100	439.3021 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2683.9036	0.2100	563.6198 (264)
Space and water heating			1002.9218 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	168.6237	0.1443	24.3376 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-441.3053	0.1335	-58.9303
PV Unit electricity exported	-387.9647	0.1253	-48.6248
Total			-107.5551 (269)
Total CO2, kg/year			931.6336 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.8800 (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	2091.9147	1.1300	2363.8636 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2683.9036	1.1300	3032.8111 (278)
Space and water heating			5396.6747 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	168.6237	1.5338	258.6407 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-441.3053	1.4935	-659.0754
PV Unit electricity exported	-387.9647	0.4600	-178.4761
Total			-837.5515 (283)
Total Primary energy kWh/year			4947.8647 (286)
Target Primary Energy Rate (TPER)			73.7300 (287)

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Property Reference	Be Green			Issued on Date	06/01/2025
Assessment Reference	GF-Unit 4 (Block A)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	86 B	DER	3.82	TER	13.29
Environmental	97 A	% DER < TER			71.26
CO ₂ Emissions (t/year)	0.24	DFEE	29.54	TFEE	34.51
Compliance Check	See BREL	% DFEE < TFEE			14.42
% DPER < TPER	42.92	DPER	40.26	TPER	70.54
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	67.1100 (1b)	2.5000 (2b)	167.7750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.1100		167.7750 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 167.7750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1192 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2692 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2288 (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	0.2918	0.2860	0.2803	0.2517	0.2460	0.2174	0.2174	0.2117	0.2288	0.2460	0.2574	0.2689 (22b)
Effective ac	0.5426	0.5409	0.5393	0.5317	0.5303	0.5236	0.5236	0.5224	0.5262	0.5303	0.5331	0.5361 (25)

3. Heat losses and heat loss parameter

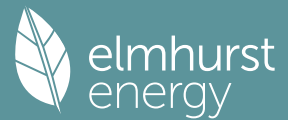
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.00)			10.5600	0.9615	10.1538		(27)
Heatloss Floor			67.1100	0.1000	6.7110	110.0000	7382.1000 (28a)
External Wall	67.1100	10.5600	56.5500	0.1300	7.3515	70.0000	3958.5000 (29a)
Total net area of external elements A _{um} (A, m ²)			134.2200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.2163		(33)
Party Wall			42.4500	0.0000	0.0000	180.0000	7641.0000 (32)
Party Ceiling			67.1100			30.0000	2013.3000 (32b)
Internal Wall			112.8500			9.0000	1015.6500 (32c)

Heat capacity C_m = Sum(A x k)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 22010.5500 (34)
327.9772 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	5.7500	0.3000	1.7250
E3 Sill	4.8000	0.0400	0.1920
E4 Jamb	21.8000	0.0500	1.0900
E5 Ground floor (normal)	16.9900	0.1600	2.7184
E7 Party floor between dwellings (in blocks of flats)	16.9900	0.0700	1.1893
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	5.0000	0.0600	0.3000

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P1 Party wall - Ground floor	16.9900	0.1600	2.7184	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.9900	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				10.1581 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =		34.3744 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	30.0392	29.9477	29.8581	29.4368	29.3580	28.9911	28.9911	28.9231	29.1324	29.3580	29.5174	29.6841 (38)
Average = Sum(39)m / 12 =	64.4137	64.3222	64.2325	63.8112	63.7324	63.3655	63.3655	63.2976	63.5068	63.7324	63.8919	64.0586 (39)
												63.8109
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9598	0.9585	0.9571	0.9508	0.9497	0.9442	0.9442	0.9432	0.9463	0.9497	0.9520	0.9545 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1740 (42)
Hot water usage for mixer showers												
Hot water usage for baths	68.2537	67.2280	65.7333	62.8735	60.7631	58.4095	57.0717	58.5551	60.1812	62.7082	65.6294	67.9922 (42a)
Hot water usage for other uses	26.2133	25.8240	25.2758	24.2649	23.5081	22.6688	22.2154	22.7598	23.3526	24.2506	25.2823	26.1247 (42b)
Average daily hot water use (litres/day)	36.8936	35.5520	34.2105	32.8689	31.5273	30.1857	30.1857	31.5273	32.8689	34.2105	35.5520	36.8936 (42c)
												120.7712 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	131.3606	128.6040	125.2195	120.0073	115.7984	111.2640	109.4729	112.8422	116.4026	121.1692	126.4637	131.0105 (44)
Distribution loss (46)m = 0.15 x (45)m	208.0432	183.1304	192.4578	164.2841	155.8869	136.8121	132.3980	139.7223	143.5360	164.4255	180.1707	205.1308 (45)
Water storage loss:												
Store volume	31.2065	27.4696	28.8687	24.6426	23.3830	20.5218	19.8597	20.9583	21.5304	24.6638	27.0256	30.7696 (46)
a) If manufacturer declared loss factor is known (kWh/day):												150.0000 (47)
Temperature factor from Table 2b												1.2960 (48)
Enter (49) or (54) in (55)												0.5400 (49)
Total storage loss												0.6998 (55)
If cylinder contains dedicated solar storage	21.6950	19.5955	21.6950	20.9952	21.6950	20.9952	21.6950	21.6950	20.9952	21.6950	20.9952	21.6950 (56)
Primary loss	21.6950	19.5955	21.6950	20.9952	21.6950	20.9952	21.6950	21.6950	20.9952	21.6950	20.9952	21.6950 (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	253.0006	223.7372	237.4152	207.7913	200.8444	180.3193	177.3554	184.6797	187.0432	209.3830	223.6779	250.0883 (62)
PV diverter	-30.5158	-26.9884	-28.2607	-23.4010	-21.8089	-18.6620	-17.4927	-18.6017	-19.3085	-22.7625	-25.7872	-29.9507 (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	222.4848	196.7487	209.1545	184.3903	179.0355	161.6572	159.8627	166.0780	167.7348	186.6204	197.8907	220.1375 (64)
12Total per year (kWh/year)												2251.7952 (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	105.1403	93.3762	99.9582	89.4302	87.7984	80.2958	79.9883	82.4236	82.5315	90.6374	94.7125	104.1719 (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	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985	108.6985 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	103.4362	114.5186	103.4362	106.8840	103.4362	106.8840	103.4362	103.4362	106.8840	103.4362	106.8840	103.4362 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	190.4603	192.4366	187.4562	176.8535	163.4695	150.8904	142.4868	140.5104	145.4908	156.0935	169.4775	182.0566 (68)
Pumps, fans	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699	33.8699 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588	-86.9588 (71)
Total internal gains	141.3176	138.9527	134.3524	124.2086	118.0085	111.5219	107.5111	110.7844	114.6271	121.8245	131.5452	140.0161 (72)
	490.8236	501.5176	480.8543	463.5557	440.5237	424.9059	409.0436	410.3405	422.6115	436.9638	463.5163	481.1184 (73)

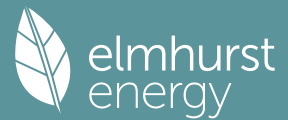
6. Solar gains

[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				3.5200	10.6334		0.5700		0.7000		0.7700		10.3495 (74)
West				7.0400	19.6403		0.5700		0.7000		0.7700		38.2319 (80)
Solar gains	48.5814	94.5682	156.7765	233.6171	292.8685	303.2101	287.2349	241.9616	183.6578	112.2880	60.4382		40.0679 (83)
Total gains	539.4050	596.0858	637.6309	697.1728	733.3922	728.1160	696.2785	652.3021	606.2693	549.2518	523.9545		521.1864 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)
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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	94.9184	95.0534	95.1861	95.8145	95.9330	96.4885	96.4885	96.5921	96.2738	95.9330	95.6936	95.4446
alpha	7.3279	7.3369	7.3457	7.3876	7.3955	7.4326	7.4326	7.4395	7.4183	7.3955	7.3796	7.3630
util living area	0.9968	0.9925	0.9796	0.9206	0.7696	0.5538	0.4002	0.4458	0.7035	0.9462	0.9915	0.9975 (86)
Living	20.4257	20.5187	20.6543	20.8289	20.9300	20.9558	20.9580	20.9578	20.9465	20.8163	20.5931	20.4074
Non living	19.4513	19.5702	19.7408	19.9509	20.0519	20.0754	20.0763	20.0772	20.0685	19.9423	19.6698	19.4318
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	20.7062	20.5187	20.6543	20.8289	20.9300	20.9558	20.9580	20.9578	20.9465	20.8163	20.5931	20.4903 (87)
Th 2	20.1169	20.1181	20.1192	20.1245	20.1255	20.1301	20.1301	20.1309	20.1283	20.1255	20.1235	20.1214 (88)
util rest of house	0.9955	0.9896	0.9714	0.8923	0.7111	0.4802	0.3212	0.3619	0.6236	0.9201	0.9875	0.9965 (89)
MIT 2	19.8516	19.5702	19.7408	19.9509	20.0519	20.0754	20.0763	20.0772	20.0685	19.9423	19.6698	19.5560 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.1472	19.8982	20.0567	20.2546	20.3555	20.3799	20.3812	20.3817	20.3721	20.2445	19.9891	19.8792 (91)
Temperature adjustment												0.0000
adjusted MIT	20.1472	19.8982	20.0567	20.2546	20.3555	20.3799	20.3812	20.3817	20.3721	20.2445	19.9891	19.8792 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9956	0.9886	0.9707	0.8970	0.7272	0.5015	0.3440	0.3862	0.6467	0.9242	0.9868	0.9961 (94)
Useful gains	537.0190	589.3041	618.9408	625.3844	533.3239	365.1399	239.5441	251.9035	392.0846	507.6409	517.0223	519.1761 (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	1020.7738	964.7178	870.7829	724.5486	551.6389	366.2449	239.6007	252.0344	398.3226	614.6702	823.5097	1004.3846 (97)
Space heating kWh	359.9136	252.2780	187.3705	71.3982	13.6264	0.0000	0.0000	0.0000	0.0000	79.6298	220.6710	360.9951 (98a)
Space heating requirement - total per year (kWh/year)												1545.8826
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	359.9136	252.2780	187.3705	71.3982	13.6264	0.0000	0.0000	0.0000	0.0000	79.6298	220.6710	360.9951 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1545.8826
Space heating per m2										(98c) / (4) =		23.0351 (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 %)												282.9236 (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	359.9136	252.2780	187.3705	71.3982	13.6264	0.0000	0.0000	0.0000	0.0000	79.6298	220.6710	360.9951 (98)
Space heating efficiency (main heating system 1)	282.9236	282.9236	282.9236	282.9236	282.9236	0.0000	0.0000	0.0000	0.0000	282.9236	282.9236	282.9236 (210)
Space heating fuel (main heating system)	127.2123	89.1682	66.2265	25.2359	4.8163	0.0000	0.0000	0.0000	0.0000	28.1453	77.9967	127.5946 (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	222.4848	196.7487	209.1545	184.3903	179.0355	161.6572	159.8627	166.0780	167.7348	186.6204	197.8907	220.1375 (64)
Efficiency of water heater	219.8395	219.8395	219.8395	219.8395	219.8395	219.8395	219.8395	219.8395	219.8395	219.8395	219.8395	219.8395 (216)
Fuel for water heating, kWh/month	101.2033	89.4965	95.1396	83.8749	81.4392	73.5342	72.7179	75.5451	76.2988	84.8894	90.0160	100.1356 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	22.6512	18.1716	16.3615	11.9871	9.2592	7.5649	8.4466	10.9792	14.2608	18.7110	21.1340	23.2807 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												546.3957 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												219.8395
Water heating fuel used												1024.2906 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												182.8078 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)

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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	1753.4941 (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	546.3957	0.1570	85.7828 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1024.2906	0.1408	144.2408 (264)
Space and water heating			230.0236 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	182.8078	0.1443	26.3848 (268)
Total CO2, kg/year			256.4085 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8200 (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	546.3957	1.5812	863.9660 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1024.2906	1.5207	1557.6367 (278)
Space and water heating			2421.6027 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	182.8078	1.5338	280.3967 (282)
Total Primary energy kWh/year			2701.9994 (286)
Dwelling Primary energy Rate (DPER)			40.2600 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	67.1100 (1b)	x 2.5000 (2b)	= 167.7750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	67.1100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 167.7750 (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) = 0.1192 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3692 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3138 (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	0.4001	0.3923	0.3844	0.3452	0.3374	0.2981	0.2981	0.2903	0.3138	0.3374	0.3531	0.3687 (22b)
Effective ac	0.5801	0.5769	0.5739	0.5596	0.5569	0.5444	0.5444	0.5421	0.5492	0.5569	0.5623	0.5680 (25)

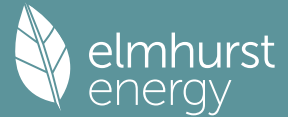
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			10.5600	1.1450	12.0916		(27)
Heatloss Floor			67.1100	0.1300	8.7243		(28a)
External Wall	67.1100	10.5600	56.5500	0.1800	10.1790		(29a)
Total net area of external elements Aum(A, m2)			134.2200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.9949		(33)

elmhurst
energy

6. Solar gains						
[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	3.5200	10.6334	0.6300	0.7000	0.7700	11.4390 (74)

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West	7.0400				19.6403				0.6300				0.7000				0.7700				42.2563 (80)			
Solar gains	53.6953	104.5228	173.2793	258.2084	323.6967	335.1270	317.4702	267.4313	202.9902	124.1078	66.8001	44.2856 (83)												
Total gains	541.0322	602.3498	650.9979	719.1327	762.0397	755.1326	721.9674	673.0525	620.5789	558.7271	527.3038	521.9987 (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	89.3438	89.5623	89.7776	90.8029	90.9973	91.9134	91.9134	92.0851	91.5584	90.9973	90.6048	90.1981	
alpha	6.9563	6.9708	6.9852	7.0535	7.0665	7.1276	7.1276	7.1390	7.1039	7.0665	7.0403	7.0132	
util living area	0.9976	0.9942	0.9836	0.9325	0.7914	0.5758	0.4173	0.4665	0.7348	0.9572	0.9936	0.9981 (86)	
MIT	20.1913	20.3232	20.5215	20.7853	20.9481	20.9951	20.9996	20.9991	20.9761	20.7645	20.4377	20.1717 (87)	
Th 2	20.0412	20.0433	20.0454	20.0552	20.0570	20.0655	20.0655	20.0671	20.0622	20.0570	20.0533	20.0494 (88)	
util rest of house	0.9965	0.9917	0.9765	0.9056	0.7300	0.4944	0.3290	0.3726	0.6489	0.9338	0.9903	0.9973 (89)	
MIT 2	19.1126	19.2820	19.5328	19.8549	20.0206	20.0634	20.0654	20.0669	20.0498	19.8400	19.4363	19.0940 (90)	
Living area fraction	19.4857	19.6421	19.8747	20.1767	20.3414	20.3856	20.3885	20.3893	20.3702	20.1597	19.7826	19.4668 (92)	
Temperature adjustment	19.4857	19.6421	19.8747	20.1767	20.3414	20.3856	20.3885	20.3893	20.3702	20.1597	19.7826	0.0000	
adjusted MIT	19.4857	19.6421	19.8747	20.1767	20.3414	20.3856	20.3885	20.3893	20.3702	20.1597	19.7826	19.4668 (93)	

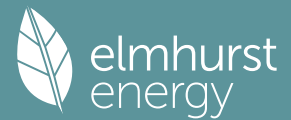
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9957	0.9904	0.9749	0.9095	0.7496	0.5227	0.3595	0.4052	0.6784	0.9368	0.9891	0.9966 (94)	
Useful gains	538.7048	596.5530	634.6322	654.0616	571.1889	394.6701	259.5790	272.6874	420.9760	523.4304	521.5386	520.2154 (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	1070.8837	1037.0635	938.6177	782.4459	598.3091	396.5921	259.6927	272.9457	431.4716	661.8937	881.9202	1066.4029 (97)	
Space heating kWh	395.9411	296.0231	226.1652	92.4367	20.1775	0.0000	0.0000	0.0000	0.0000	103.0167	259.4747	406.3635 (98a)	
Space heating requirement - total per year (kWh/year)												1799.5985	
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	395.9411	296.0231	226.1652	92.4367	20.1775	0.0000	0.0000	0.0000	0.0000	103.0167	259.4747	406.3635 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1799.5985	
Space heating per m2										(98c) / (4) =		26.8157 (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	395.9411	296.0231	226.1652	92.4367	20.1775	0.0000	0.0000	0.0000	0.0000	103.0167	259.4747	406.3635 (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)	428.9719	320.7184	245.0327	100.1481	21.8608	0.0000	0.0000	0.0000	0.0000	111.6107	281.1211	440.2638 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Water heating													
Water heating requirement	214.8915	190.0495	202.1410	178.5434	173.5710	156.9619	155.4246	161.3542	162.8330	180.8767	191.4356	212.6747 (64)	
Efficiency of water heater (217)m	85.4112	85.0496	84.3122	82.6577	80.6513	79.8000	79.8000	79.8000	79.8000	82.8469	84.7424	79.8000 (216)	
Fuel for water heating, kWh/month	251.5965	223.4573	239.7529	216.0032	215.2117	196.6941	194.7676	202.1982	204.0514	218.3264	225.9031	85.4876 (217)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)	
Lighting	20.8937	16.7617	15.0920	11.0571	8.5408	6.9779	7.7912	10.1273	13.1543	17.2592	19.4942	21.4744 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.0223	-26.7218	-40.3726	-47.7910	-53.6459	-50.8531	-50.2417	-46.3870	-39.9493	-31.6103	-20.2778	-15.4325 (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	-6.5432	-14.0651	-28.5224	-43.6804	-58.5846	-59.1626	-58.4579	-49.1069	-35.4921	-20.3777	-8.8204	-5.1515 (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												1949.7275 (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												2636.7408 (219)	
Space cooling fuel												0.0000 (221)	

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Electricity for pumps and fans:	86.0000 (231)
Total electricity for the above, kWh/year	
Electricity for lighting (calculated in Appendix L)	168.6237 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-829.2700 (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	4011.8221 (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	1949.7275	0.2100	409.4428 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2636.7408	0.2100	553.7156 (264)
Space and water heating			963.1583 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	168.6237	0.1443	24.3376 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-441.3053	0.1335	-58.9303
PV Unit electricity exported	-387.9647	0.1253	-48.6248
Total			-107.5551 (269)
Total CO2, kg/year			891.8701 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.2900 (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	1949.7275	1.1300	2203.1921 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2636.7408	1.1300	2979.5171 (278)
Space and water heating			5182.7092 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	168.6237	1.5338	258.6407 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-441.3053	1.4935	-659.0754
PV Unit electricity exported	-387.9647	0.4600	-178.4761
Total			-837.5515 (283)
Total Primary energy kWh/year			4733.8992 (286)
Target Primary Energy Rate (TPER)			70.5400 (287)

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Property Reference	Be Green			Issued on Date	06/01/2025
Assessment Reference	TF-Unit 19 (Block B)	Prop Type Ref	Old Market Street		
Property	Land at, Old Market Street, Manchester, Crumpsall, M9 8DS				
SAP Rating	87 B	DER	3.41	TER	11.45
Environmental	97 A	% DER < TER			70.22
CO ₂ Emissions (t/year)	0.21	DFEE	19.36	TFEE	23.99
Compliance Check	See BREL	% DFEE < TFEE			19.30
% DPER < TPER	40.32	DPER	36.18	TPER	60.62
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.8700 (1b)	x 2.4000 (2b)	= 150.8880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 150.8880 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1325 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2825 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2402 (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	0.3062	0.3002	0.2942	0.2642	0.2582	0.2282	0.2282	0.2222	0.2402	0.2582	0.2702	0.2822 (22b)
Effective ac	0.5469	0.5451	0.5433	0.5349	0.5333	0.5260	0.5260	0.5247	0.5288	0.5333	0.5365	0.5398 (25)

3. Heat losses and heat loss parameter

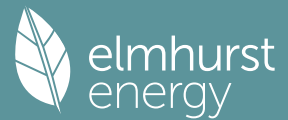
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (U _w = 1.00)			11.4800	0.9615	11.0385		(27)
External Wall	23.8300	11.4800	12.3500	0.1300	1.6055	70.0000	864.5000 (29a)
External Roof	62.8700		62.8700	0.1000	6.2870	9.0000	565.8300 (30)
Total net area of external elements A _{um} (A, m ²)			86.7000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	18.9310			(33)
Party Wall			54.2200	0.0000	0.0000	180.0000	9759.6000 (32)
Party Floor			62.8700			40.0000	2514.8000 (32d)
Internal Wall			125.1400			9.0000	1126.2600 (32c)

Heat capacity C_m = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 14830.9900 (34)
Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 235.8993 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.1500	0.3000	1.8450
E3 Sill	5.2000	0.0400	0.2080
E4 Jamb	17.4000	0.0500	0.8700
E7 Party floor between dwellings (in blocks of flats)	9.9300	0.0700	0.6951
E18 Party wall between dwellings	4.8000	0.0600	0.2880
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	22.5900	0.0000	0.0000
E15 Flat roof with parapet	9.9300	0.2800	2.7804

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P4 Party wall - Roof (insulation at ceiling level) 22.5900 0.1200 2.7108
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.3973 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 28.3283 (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 27.2310 27.1403 27.0515 26.6341 26.5560 26.1925 26.1925 26.1252 26.3325 26.5560 26.7140 26.8791 (38)
 55.5592 55.4686 55.3797 54.9624 54.8843 54.5208 54.5208 54.4535 54.6608 54.8843 55.0423 55.2074 (39)
 Average = Sum(39)m / 12 = 54.9620

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 HLP (average) 0.8837 0.8823 0.8809 0.8742 0.8730 0.8672 0.8672 0.8661 0.8694 0.8730 0.8755 0.8781 (40)
 Days in mont 31 28 31 30 31 30 31 31 30 31 30 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0615 (42)
 Hot water usage for mixer showers 66.1324 65.1385 63.6903 60.9194 58.8745 56.5941 55.2979 56.7352 58.3107 60.7592 63.5896 65.8790 (42a)
 Hot water usage for baths 25.4024 25.0251 24.4939 23.5143 22.7809 21.9675 21.5282 22.0558 22.6302 23.5005 24.5002 25.3165 (42b)
 Hot water usage for other uses 35.7419 34.4422 33.1425 31.8428 30.5431 29.2434 29.2434 30.5431 31.8428 33.1425 34.4422 35.7419 (42c)
 Average daily hot water use (litres/day) 117.0165 (43)
 Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 127.2767 124.6059 121.3267 116.2765 112.1985 107.8050 106.0696 109.3341 112.7837 117.4021 122.5320 126.9374 (44)
 Energy conte 201.5752 177.4371 186.4746 159.1767 151.0407 132.5589 128.2819 135.3784 139.0736 159.3136 174.5693 198.7533 (45)
 Energy content (annual) Total = Sum(45)m = 1943.6333
 Distribution loss (46)m = 0.15 x (45)m 30.2363 26.6156 27.9712 23.8765 22.6561 19.8838 19.2423 20.3068 20.8610 23.8970 26.1854 29.8130 (46)
 Water storage loss: 150.0000 (47)
 Store volume 1.2960 (48)
 a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)
 Temperature factor from Table 2b 0.6998 (55)
 Enter (49) or (54) in (55)
 Total storage loss 21.6950 19.5955 21.6950 20.9952 21.6950 20.9952 21.6950 21.6950 20.9952 21.6950 20.9952 21.6950 (56)
 If cylinder contains dedicated solar storage 21.6950 19.5955 21.6950 20.9952 21.6950 20.9952 21.6950 21.6950 20.9952 21.6950 20.9952 21.6950 (57)
 Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 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 (61)
 Total heat required for water heating calculated for each month 246.5326 218.0438 231.4320 202.6839 195.9982 176.0661 173.2394 180.3358 182.5808 204.2710 218.0765 243.7108 (62)
 WWHRS -29.5674 -26.1496 -27.3824 -22.6737 -21.1311 -18.0820 -16.9490 -18.0236 -18.7083 -22.0551 -24.9857 -29.0198 (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 216.9652 191.8942 204.0497 180.0103 174.8671 157.9841 156.2904 162.3123 163.8724 182.2159 193.0908 214.6910 (64)
 Total per year (kWh/year) = Sum(64)m = 2198.2433 (64)
 2198 (64)
 12Total per year (kWh/year)
 Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
 Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
 Heat gains from water heating, kWh/month 102.9897 91.4832 97.9688 87.7320 86.1870 78.8816 78.6197 80.9793 81.0477 88.9377 92.8500 102.0514 (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
 103.0755 103.0755 103.0755 103.0755 103.0755 103.0755 103.0755 103.0755 103.0755 103.0755 103.0755 103.0755 (66)
 Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 94.8097 104.9679 94.8097 97.9701 94.8097 97.9701 94.8097 94.8097 97.9701 94.8097 97.9701 94.8097 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 180.1228 181.9919 177.2818 167.2546 154.5970 142.7006 134.7531 132.8840 137.5941 147.6213 160.2789 172.1753 (68)
 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 33.3075 (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) -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 -82.4604 (71)
 Water heating gains (Table 5) 138.4270 136.1357 131.6784 121.8500 115.8427 109.5578 105.6716 108.8431 112.5663 119.5399 128.9584 137.1659 (72)
 Total internal gains 467.2822 477.0182 457.6926 440.9973 419.1721 404.1511 389.1571 390.4595 402.0531 415.8937 441.1300 458.0736 (73)

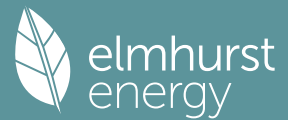
6. Solar gains

[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
 South 11.4800 46.7521 0.5700 0.7000 0.7700 148.4051 (78)
 Solar gains 148.4051 243.0493 309.6017 349.9171 364.6353 350.9119 342.8622 332.9667 323.4155 262.1515 175.9106 128.2357 (83)
 Total gains 615.6873 720.0675 767.2943 790.9144 783.8074 755.0629 732.0194 723.4262 725.4686 678.0451 617.0407 586.3092 (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

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tau	74.1501	74.2712	74.3904	74.9553	75.0619	75.5623	75.5623	75.6558	75.3688	75.0619	74.8465	74.6226
alpha	5.9433	5.9514	5.9594	5.9970	6.0041	6.0375	6.0375	6.0437	6.0246	6.0041	5.9898	5.9748
util living area	0.9688	0.9307	0.8750	0.7735	0.6330	0.4598	0.3275	0.3459	0.5150	0.7742	0.9314	0.9752 (86)
Living	20.4805	20.6335	20.7622	20.8730	20.9281	20.9461	20.9483	20.9482	20.9434	20.8835	20.6793	20.4459
Non living	19.5886	19.7751	19.9271	20.0538	20.1087	20.1281	20.1294	20.1303	20.1244	20.0680	19.8386	19.5500
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	20.7343	20.6335	20.7622	20.8730	20.9281	20.9461	20.9483	20.9482	20.9434	20.8835	20.6793	20.5234 (87)
Th 2	20.1814	20.1826	20.1838	20.1895	20.1905	20.1955	20.1955	20.1964	20.1936	20.1905	20.1884	20.1861 (88)
util rest of house	0.9612	0.9160	0.8509	0.7362	0.5836	0.4030	0.2677	0.2857	0.4568	0.7306	0.9142	0.9691 (89)
MIT 2	19.9451	19.7751	19.9271	20.0538	20.1087	20.1281	20.1294	20.1303	20.1244	20.0680	19.8386	19.6646 (90)
Living area fraction									fLA = Living area / (4) =			0.4129 (91)
MIT	20.2709	20.1296	20.2719	20.3921	20.4470	20.4658	20.4675	20.4681	20.4626	20.4047	20.1857	20.0192 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2709	20.1296	20.2719	20.3921	20.4470	20.4658	20.4675	20.4681	20.4626	20.4047	20.1857	20.0192 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9621	0.9149	0.8537	0.7459	0.5996	0.4222	0.2879	0.3060	0.4764	0.7427	0.9141	0.9676 (94)
Useful gains	592.3700	658.7925	655.0515	589.9731	469.9466	318.7774	210.7793	221.3998	345.6147	503.5521	564.0577	567.3106 (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	887.3327	844.7620	762.6851	631.6311	480.0755	319.8105	210.8612	221.5202	347.7854	538.1250	720.2668	873.3393 (97)
Space heating kWh	219.4522	124.9715	80.0794	29.9938	7.5359	0.0000	0.0000	0.0000	0.0000	25.7222	112.4706	227.6854 (98a)
Space heating requirement - total per year (kWh/year)												827.9110
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	219.4522	124.9715	80.0794	29.9938	7.5359	0.0000	0.0000	0.0000	0.0000	25.7222	112.4706	227.6854 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												827.9110
Space heating per m2										(98c) / (4) =		13.1686 (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 %)												261.5187 (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	219.4522	124.9715	80.0794	29.9938	7.5359	0.0000	0.0000	0.0000	0.0000	25.7222	112.4706	227.6854 (98)
Space heating efficiency (main heating system 1)	261.5187	261.5187	261.5187	261.5187	261.5187	0.0000	0.0000	0.0000	0.0000	261.5187	261.5187	261.5187 (210)
Space heating fuel (main heating system)	83.9145	47.7868	30.6209	11.4691	2.8816	0.0000	0.0000	0.0000	0.0000	9.8357	43.0067	87.0627 (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	216.9652	191.8942	204.0497	180.0103	174.8671	157.9841	156.2904	162.3123	163.8724	182.2159	193.0908	214.6910 (64)
Efficiency of water heater	219.6849	219.6849	219.6849	219.6849	219.6849	219.6849	219.6849	219.6849	219.6849	219.6849	219.6849	219.6849 (216)
Fuel for water heating, kWh/month	98.7620	87.3498	92.8829	81.9402	79.5991	71.9140	71.1430	73.8842	74.5943	82.9442	87.8944	97.7268 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	20.2829	16.2717	14.6509	10.7339	8.2911	6.7739	7.5635	9.8313	12.7699	16.7547	18.9244	20.8467 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												316.5781 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												219.6849
Water heating fuel used												1000.6349 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												163.6950 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)

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Appendix Q - special features

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1480.9079 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	316.5781	0.1581	50.0523 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	1000.6349	0.1408	140.8938 (264)
Space and water heating			190.9461 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	163.6950	0.1443	23.6262 (268)
Total CO ₂ , kg/year			214.5724 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4100 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	316.5781	1.5852	501.8476 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1000.6349	1.5206	1521.6042 (278)
Space and water heating			2023.4519 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	163.6950	1.5338	251.0808 (282)
Total Primary energy kWh/year			2274.5327 (286)
Dwelling Primary energy Rate (DPER)			36.1800 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.8700 (1b)	x 2.4000 (2b)	= 150.8880 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.8700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 150.8880 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1325 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3825 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3252 (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	0.4146	0.4065	0.3983	0.3577	0.3496	0.3089	0.3089	0.3008	0.3252	0.3496	0.3658	0.3821 (22b)
Effective ac	0.5859	0.5826	0.5793	0.5640	0.5611	0.5477	0.5477	0.5452	0.5529	0.5611	0.5669	0.5730 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (Uw = 1.20)			11.4800	1.1450	13.1450		(27)
External Wall	23.8300	11.4800	12.3500	0.1800	2.2230		(29a)
External Roof	62.8700		62.8700	0.1100	6.9157		(30)
Total net area of external elements Aum(A, m ²)			86.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.2837		(33)
Party Wall			54.2200	0.0000	0.0000		(32)

235.8993 (35)

List of Thermal Bridges

- K1 Element
- E2 Other lintels (including other steel lintels)
- E3 Sill
- E4 Jamb
- E7 Party floor between dwellings (in blocks of flats)
- E18 Party wall between dwellings
- P3 Party wall - Intermediate floor between dwellings (in blocks of flats)
- E15 Flat roof with parapet
- P4 Party wall - Roof (insulation at ceiling level)

$$\begin{aligned} & \quad \quad \quad (36a) = 0.0000 \\ (33) + (36) + (36a) &= 32.9759 \quad (37) \end{aligned}$$
[illegible]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9886	0.9859	0.9833	0.9712	0.9689	0.9583	0.9583	0.9563	0.9624	0.9689	0.9735	0.9783 (40)
HLP (average)												0.9712
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy

Assumed occupancy											2.0615 (42)
Hot water usage for mixer showers											
58.7843	57.9009	56.6136	54.1506	52.3329	50.3059	49.1537	50.4313	51.8317	54.0081	56.5241	58.5591 (42a)
Hot water usage for baths											
25.4024	25.0251	24.4939	23.5143	22.7809	21.9675	21.5282	22.0558	22.6302	23.5005	24.5002	25.3165 (42b)
Hot water usage for other uses											
35.7419	34.4422	33.1425	31.8428	30.5431	29.2434	28.0431	30.5431	31.8428	33.1425	34.4422	35.7419 (42c)
Average daily hot water use (litres/day)											110.2419 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.9286	117.3683	114.2500	109.5077	105.6569	101.5168	99.9253	103.0302	106.3047	110.6511	115.4665	119.6175 (44)	
Energy content	189.9377	167.1308	175.5980	149.9106	142.2344	124.8268	120.8510	127.5729	131.0843	150.1525	164.5032	187.2922 (45)	
Energy content (annual)										Total = Sum(45)m =			1831.0943

Water storage loss:

Water storage loss:	
Store volume	150.0000 (47)

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

Temperature factor from Table 2b

Enter (49) or (54) in (55) 0.7527 (55)

Enter (49) or (54)
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)
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If cylinder contains dedicated solar storage

11	Cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
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	23.3323	21.8143	23.3323	22.5120	23.3323	22.5120	23.3323	23.3323	22.5120	23.3323	22.5120	23.3323	(59)
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)

[illegible]

Total heat required for water heating calculated for each month

236.5326	209.2166	222.1929	195.0024	188.8293	169.9186	167.4459	174.1678	176.1762	196.7474	209.5950	233.8871	(62)
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WWHRS	-26.8737	-23.7674	-24.8878	-20.6081	-19.2060	-16.4347	-15.4049	-16.3816	-17.0040	-20.0458	-22.7095	-26.3761 (63a
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[illegible][illegible][illegible]

Output from w/h

Total per year (kWh/year) = Sum(64)m = 2130.0122 (64)

12Total per year (kWh/year)

12Total per year (kWh/year)	2130 (64)
Electric shower(s)	

[illegible][illegible]

Heat gains from water heating, kWh/month

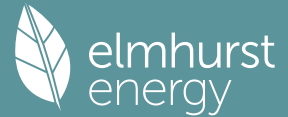
heat gains from water heating, kWh/month	100.4302	89.2396	95.6622	85.9187	84.5689	77.5784	77.4589	79.6939	79.6590	87.2016	90.7708	99.5506 (65)
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Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	103.0755	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	92.5834	102.5031	92.5834	95.6695	92.5834	95.6695	92.5834	92.5834	95.6695	92.5834	95.6695	92.5834	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.1228	181.9919	177.2818	167.2546	154.5970	142.7006	134.7531	132.8840	137.5941	147.6213	160.2789	172.1753	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	33.3075	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	-82.4604	(71)
Water heating gains (Table 5)	134.9868	132.7970	128.5783	119.3316	113.6678	107.7477	104.1114	107.1155	110.6375	117.2065	126.0705	133.8045	(72)
Total internal gains	464.6157	474.2146	455.3661	439.1783	417.7708	400.0405	385.3706	386.5055	397.8238	414.3339	438.9416	455.4859	(73)

[Jan				Area m ²	Solar flux Table 6a W/m ²		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
South				11.4800	46.7521		0.6300		0.7000		0.7700		164.0267 (78)
Solar gains	164.0267	268.6334	342.1914	386.7505	403.0180	387.8500	378.9530	368.0159	357.4593	289.7464	194.4276		141.7342 (83)

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Total gains 628.6423 742.8480 797.5575 825.9288 820.7888 787.8905 764.3236 754.5214 755.2831 704.0803 633.3692 597.2200 (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	66.2849	66.4626	66.6377	67.4726	67.6312	68.3791	68.3791	68.5195	68.0891	67.6312	67.3112	66.9799	
alpha	5.4190	5.4308	5.4425	5.4982	5.5087	5.5586	5.5586	5.5680	5.5393	5.5087	5.4874	5.4653	
util living area	0.9729	0.9395	0.8896	0.7953	0.6597	0.4846	0.3462	0.3657	0.5433	0.7984	0.9406	0.9783 (86)	
MIT	20.2150	20.4472	20.6555	20.8486	20.9538	20.9931	20.9991	20.9988	20.9868	20.8680	20.5291	20.1715 (87)	
Th 2	20.0929	20.0951	20.0972	20.1074	20.1093	20.1182	20.1182	20.1199	20.1148	20.1093	20.1055	20.1014 (88)	
util rest of house	0.9659	0.9256	0.8661	0.7569	0.6058	0.4199	0.2772	0.2962	0.4774	0.7535	0.9246	0.9726 (89)	
MIT 2	19.2084	19.4940	19.7428	19.9672	20.0737	20.1144	20.1179	20.1195	20.1069	19.9937	19.6069	19.1611 (90)	
Living area fraction									fLA = Living area / (4) =				0.4129 (91)
MIT	19.6240	19.8876	20.1197	20.3312	20.4371	20.4772	20.4818	20.4825	20.4702	20.3548	19.9877	19.5783 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.6240	19.8876	20.1197	20.3312	20.4371	20.4772	20.4818	20.4825	20.4702	20.3548	19.9877	19.5783 (93)	

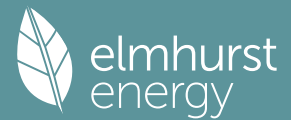
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9615	0.9220	0.8667	0.7670	0.6261	0.4465	0.3057	0.3249	0.5042	0.7666	0.9222	0.9685 (94)
Useful gains	604.4663	684.9040	691.2753	633.5265	513.9180	351.7945	233.6459	245.1428	380.8274	539.7363	584.0617	578.4230 (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	952.4142	929.0135	842.0051	697.9612	532.2146	354.0931	233.8706	245.4619	385.4284	594.2064	788.7802	945.8692 (97)
Space heating kWh	258.8733	164.0416	112.1429	46.3930	13.6127	0.0000	0.0000	0.0000	0.0000	40.5257	147.3973	273.3800 (98a)
Space heating requirement - total per year (kWh/year)												1056.3664
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	258.8733	164.0416	112.1429	46.3930	13.6127	0.0000	0.0000	0.0000	0.0000	40.5257	147.3973	273.3800 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1056.3664
Space heating per m2										(98c) / (4) =		16.8024 (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	258.8733	164.0416	112.1429	46.3930	13.6127	0.0000	0.0000	0.0000	0.0000	40.5257	147.3973	273.3800 (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)	280.4694	177.7265	121.4983	50.2633	14.7483	0.0000	0.0000	0.0000	0.0000	43.9065	159.6937	296.1863 (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	209.6588	185.4492	197.3051	174.3943	169.6233	153.4839	152.0410	157.7862	159.1722	176.7016	186.8855	207.5110 (64)
Efficiency of water heater (217)m	84.5338	83.7858	82.8428	81.5364	80.4054	79.8000	79.8000	79.8000	79.8000	81.3379	83.5330	79.8000 (216)
Fuel for water heating, kWh/month	248.0178	221.3372	238.1681	213.8851	210.9601	192.3357	190.5276	197.7270	199.4639	217.2438	223.7265	245.0562 (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	19.2370	15.4326	13.8954	10.1804	7.8636	6.4246	7.1734	9.3243	12.1113	15.8907	17.9486	19.7717 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-16.9147	-25.0975	-37.9488	-44.9632	-50.5133	-47.9039	-47.3303	-43.6781	-37.5856	-29.7070	-19.0384	-14.4822 (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	-6.0989	-13.1124	-26.5934	-40.7291	-54.6265	-55.1610	-54.5016	-45.7824	-33.0895	-18.9964	-8.2214	-4.8013 (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												1144.4923 (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												2598.4491 (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)												155.2536 (232)

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

PV generation	-776.8768 (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	3207.3183 (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	1144.4923	0.2100	240.3434 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2598.4491	0.2100	545.6743 (264)
Space and water heating			786.0177 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	155.2536	0.1443	22.4079 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.1630	0.1335	-55.4314
PV Unit electricity exported	-361.7139	0.1253	-45.3345
Total			-100.7660 (269)
Total CO2, kg/year			719.5889 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.4500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1144.4923	1.1300	1293.2764 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2598.4491	1.1300	2936.2475 (278)
Space and water heating			4229.5238 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	155.2536	1.5338	238.1332 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.1630	1.4934	-620.0028
PV Unit electricity exported	-361.7139	0.4600	-166.3994
Total			-786.4022 (283)
Total Primary energy kWh/year			3811.3557 (286)
Target Primary Energy Rate (TPER)			60.6200 (287)