



EAL CONSULT BUILDING SUSTAINABILITY SINCE 2008

ENERGY & SUSTAINABILITY ASSESSMENT

13 BEDFORD ROAD

PROPERTY ADDRESS

13 BEDFORD RD
WOOD GREEN
LONDON
N22 7AU

DATE

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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 12 new build flats in Wood Green, with a gross internal residential floor area of 808m² and a non-domestic floor area of 258m².

Strategy

The strategy highlights how the proposed development will promote sustainability through both design and operation and responds to the UK Planning and regulatory framework, National Planning Policy Framework 2021, the London Plan 2021, Haringey's Local Plan Strategic Policies and Development Management DPD, summarising how the relevant targets will be addressed and achieved.

Energy Hierarchy

In accordance with the Energy Hierarchy detailed within The London Plan 2021, 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 **65%** 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 and Photovoltaic panels have been proposed for the specific scheme and will deliver a further **23%** 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** carbon emission reduction of **89%**
- To combat the shortfall in reduction, the following carbon offset is suggested:
 - **£2669.5**

Overheating

Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the cooling hierarchy. This project reaches the passive ventilation stage of the following cooling hierarchy:

- 1) Reduce the amount of the heat entering a building in summer
- 2) Minimise internal heat generation
- 3) Manage the heat within the building
- 4) Passive ventilation
- 5) Mechanical ventilation
- 6) Provide active cooling systems.

Sustainability**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

Urban Greening

- Urban Greening Factor (UGF) of 0.4 proposed

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.
- Site specific material details are highlighted in Section 5e.

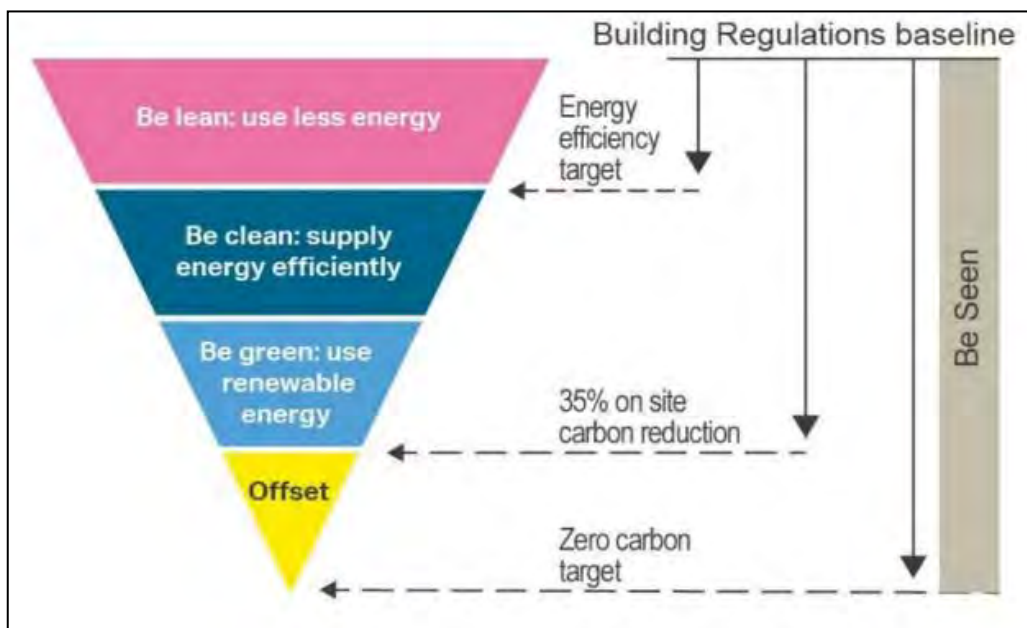
2. METHODOLOGY

This energy assessment outlines the energy demand from the development together with the associated CO₂ emissions, using Building Regulations Part L 2013 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 London Plan 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) 2021

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:
 - o 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);
 - o consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
 - o 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.

The London Plan 2021

Policy SI 2 Minimising Greenhouse Gas Emissions:

- A. Major development should be net zero-carbon. Proposals should make the fullest contribution to reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy: i) Be lean: use less energy and manage demand during operation, ii) Be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly, iii) Be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site, iiiii) Be seen: monitor, verify and report on energy performance
- B. Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.
- C. A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either: i) through a cash in lieu contribution to the borough's carbon offset fund, or i) off-site provided that an alternative proposal is identified, and delivery is certain.
- D. Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.
- E. Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.

Policy 5.3 Sustainable Design and Construction

Major development proposals should meet minimum standards outlines in the supplementary guidance Sustainable Design and Construction SPG (2014), to consider the following principles:

- a. Minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems)
- b. Avoiding internal overheating and contributing to the urban heat island effect
- c. Efficient use of natural resources (including water), including making the most of natural systems both within and around buildings
- d. Minimising pollution (including noise, air and urban runoff)
- e. Minimising the generation of waste and maximising reuse or recycling
- f. Avoiding impacts from natural hazards (including flooding)
- g. Ensuring developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions
- h. Securing sustainable procurement of materials, using local supplies where feasible, and
- i. Promoting and protecting biodiversity and green infrastructure.

Haringey's Local Plan Strategic Policies 2013 – 2026**Policy SP4: Working towards a Low Carbon Haringey**

Over the life time of the Local Plan, reducing energy use in buildings and working towards a low carbon borough will be one of the key challenges facing Haringey. The Council will promote the measures outlined below to reduce carbon emissions from new and existing buildings.

1. In line with London Plan policy, the Council will promote and require all new developments to take measures to reduce energy use and carbon emissions during design, construction and occupation, by incorporating the following measures:
 - a. From 2011 onwards, all new residential development will achieve a minimum 25% reduction in total (regulated) CO2 emissions in line with Code for Sustainable Homes Level 4 energy standards, and should aim to achieve Level 6. All new residential development shall be zero carbon from 2016 onwards; and
 - b. From 2011 onwards all new non-residential development shall be built to at least BREEAM “very good” standard and should aim to achieve BREEAM “excellent” or the current nationally agreed standard. All new non-residential development shall be zero carbon from 2019.
2. The Council will promote low- and zero-carbon energy generation through the following measures:
 - a. Requiring all developments to assess, identify and implement, where viable, site-wide and area-wide decentralised energy facilities including the potential to link into a wider network;
 - b. Establishing local networks of decentralised heat and energy facilities by requiring developers to prioritise connection to existing or planned networks where feasible;
 - c. Working with neighbouring boroughs and other partners to explore ways of implementing sub-regional decentralised energy networks including the potential in the Upper Lee Valley Opportunity Area; and
 - d. All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from on site renewable energy regeneration, which can include connections to local sources of decentralised renewable energy.

Development Management DPD 2017

Policy DM19: Nature Conservation

- A. Development proposals on sites which are, or are adjacent to, internationally designated sites, Sites of Special Scientific Interest, Local Nature Reserves, Sites of Importance for Nature Conservation or Ecological Corridors, should protect and enhance the nature conservation value of the site.
- B. Development that has a direct or indirect adverse impact upon important ecological assets, either individually or in combination with other development, will only be permitted where:
 - a The harm cannot be reasonably avoided; and
 - b It has been suitably demonstrated that appropriate mitigation can address the harm caused.

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 and graph demonstrate the carbon emissions and savings.

Table 1. Sitewide 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	8.3	
After Energy Demand Reduction (Be Lean)	2.9	
After Heat Network Connection (Be Clean)	2.9	
After Renewables (Be Green)	0.9	

Table 2. Sitewide 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	5.4	65
Be Clean: Savings from Heat Network	0.0	0
Be Green: Savings from Renewable Energy	1.9	23
Cumulative on-site savings	7.4	89
Annual Savings from off-set payment	1.0	
(tonnes CO₂)		
Cumulative Savings for offset payment	28.1	
Cash-in-lieu contribution	2669.5	

a. Baseline Model

In accordance with London Plan Policy SI 2, a baseline model is run assuming the development complied with Part L 2021 of the Building Regulations. 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 heatpump. The comparative Be 'Lean' model assumes the same heating strategy.

The assumed U-values of the baseline model are seen in the table below:

Table 3. Part L Building Regulations U-values

Thermal element	2021 Baseline Model	Be 'Lean' Scenario
Walls	0.16 W/m ² k	0.15 W/m ² k
Roof	0.11 W/m ² k	0.11 W/m ² k
Floor	0.18 W/m ² k	0.18 W/m ² k
Glazing & Doors	1.00 W/m ² k	0.80 W/m ² k

b. Be 'Lean' - Demand Reduction

In accordance with London Plan Policy SI 2 the development must achieve at least a 10% improvement in energy efficiency on Building Regulations Part L 2013 baseline scenario.

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 building is estimated to achieve **65%** 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 4. Energy Efficient Design Specification

Element	Building Regulations 2021 Standard	Specification
Walls	0.18 W/m ² k	0.15 W/m ² k
Roof	0.11 W/ m ² k	0.11 W/ m ² k
Floor	0.18 W/m ² k	0.18 W/m ² k
Glazing	1.2 W/ m ² k	0.8 W/ m ² k

Table 5. Development Part L Fabric Energy Efficiency Standard (FEES)

	Target Fabric Energy Efficiency (MWh/year)	Design Fabric Energy Efficiency (MWh/year)	Improvement %
Development Total	34.26	29.36	14

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 dwelling.

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

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

Energy Use Intensity and Space Heating Demand

Table 6. Energy Use Intensity (EUI) and Space Heating Demand

Building type	EUI	Space heating demand	EUI value from Table 4 of the guidance	Space heating demand from Table 4 of the guidance	Methodology used
	excluding renewable energy (kWh/m ² /year)				
Residential	2.4	6.82	35	15	Part L1 SAP
Non-residential	54.7	6.0	55	15	Part L2 SBEM

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. Policy SI 3 seeks for new development to promote the use of CHP and district heating.

Policy SI 1 Improving Air Quality

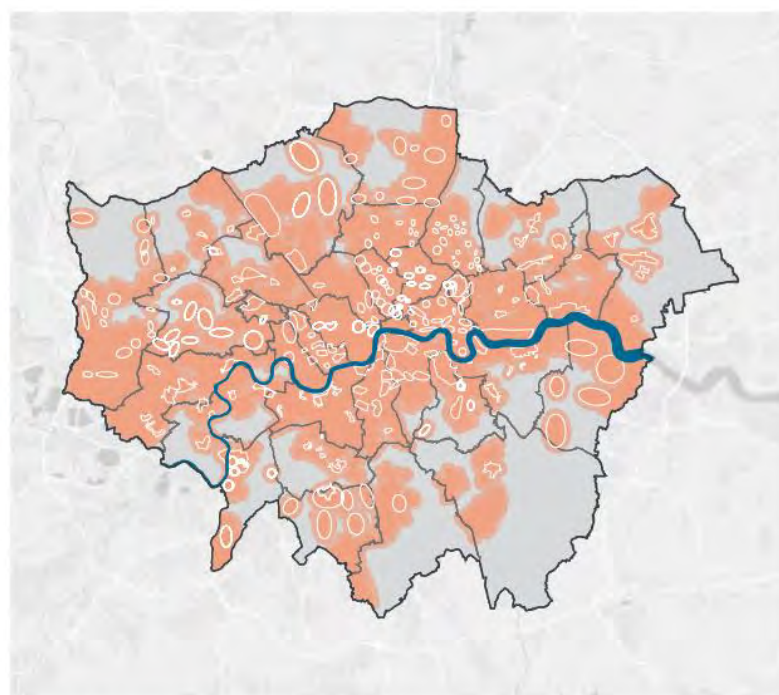
- A. Development Plans, through relevant strategic, site-specific and area-based policies, should seek opportunities to identify and deliver further improvements to air quality and should not reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality.
- B. To tackle poor air quality, protect health and meet legal obligations the following criteria should be addressed:
 1. Development proposals should not:
 - a. lead to further deterioration of existing poor air quality
 - b. create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits
 - c. create unacceptable risk of high levels of exposure to poor air quality.
 2. In order to meet the requirements in Part 1, as a minimum:
 - a. development proposals must be at least Air Quality Neutral
 - b. development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local

- problems of air quality in preference to post-design or retro-fitted mitigation measures
- c. major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will meet the requirements of B1
 - d. development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people should demonstrate that design measures have been used to minimise exposure.
- E. Development proposals should ensure that where emissions need to be reduced to meet the requirements of Air Quality Neutral or to make the impact of development on local air quality acceptable, this is done on-site. Where it can be demonstrated that emissions cannot be further reduced by on-site measures, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated within the area affected by the development.

Policy SI 3 Energy Infrastructure

- A. Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy and infrastructure requirements arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development.
- C. Development Plans should:
 1. identify the need for, and suitable sites for, any necessary energy infrastructure requirements including energy centres, energy storage and upgrades to existing infrastructure
 2. identify existing heating and cooling networks, identify proposed locations for future heating and cooling networks and identify opportunities for expanding and inter-connecting existing networks as well as establishing new networks.

Figure 2 – Heat Network Priority Areas



Heat Network Priority Areas

- Heat Network Priority Areas
- Local Authority Heat Network Studies

Source: GLA
Environment

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District Heating and Cooling

The site does not fall into an opportunity area with decentralised energy potential as identified in the London Plan or Local Plan.

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

In line with London Plan Policy SI 1 all developments are required to demonstrate compliance with the Building Emission Benchmarks (BEB) set out in the Air Quality Neutral LPG. The BEB demonstrates the emissions from equipment used to supply heat and energy to the buildings.

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

d. Be 'Green' - Renewable Energy

In accordance with London Plan Policy SI 2 and Local Plan Policy SP4 all new development must achieve a minimum 20% reduction from on-site renewable energy generation.

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 7. 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. 	• Less volume of storage • Less maintenance and produce considerably less ash residue	• Nox Emissions which may impact • High Costs • Not suitable for the project

Ground Source Heat Pump 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 	• Use all through the year	• High Costs • Not suitable for this project
Air Source Heat Pump 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	• 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	• Needs electricity • Can be noisy
Wind Turbines 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. 	• Cheaper • Less CO₂	• 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
Solar Photovoltaic Panels (PV) 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. 	• Cheaper • Less CO₂ • No input power in order to generate electricity.	

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 and photovoltaic panels are to be incorporated in the design because together they achieve a CO₂ percentage reduction of **23%** contributing to an overall reduction of **89%** in carbon emissions.

The layout of these technologies can be seen in Figure 3 below and Appendix 3 of the report.

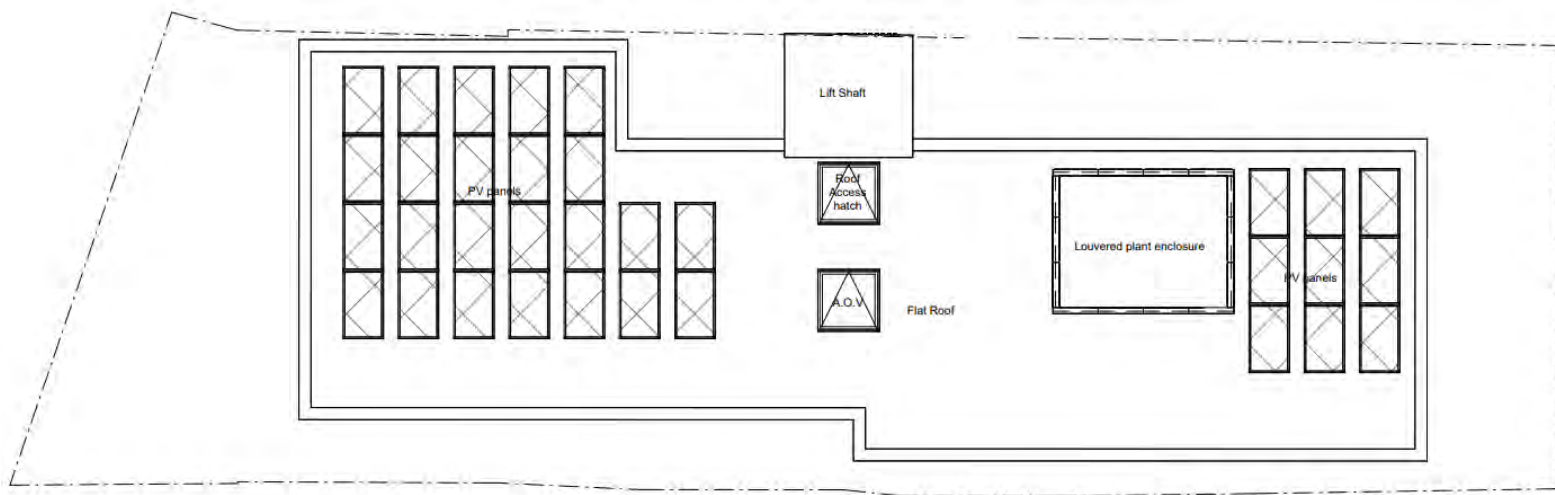
Table 8. Photovoltaic Panels

System size	Pitch	Orientation
13.25 kWp	Horizontal	South facing

Table 9. ASHP Specification

Seasonal Coefficient of Performance (SCOP) (W/W)		Seasonal Energy Efficiency Ratio (SEER) (W/W)	
Water at 35	Water at 55	Water at 7	Water at 18
4.95	3.52	5.34	8.21

Figure 3: Proposed Roof Plan



e. Be 'Seen' - Monitoring Performance

In accordance with London Plan Policy Guidance 'Be Seen' Energy Monitoring 1.2, the following is suggested:

1.2.1 To truly achieve net zero-carbon buildings we need to have a better understanding of their actual operational energy performance. Although Part L calculations and Energy Performance Certificates (EPCs) give an indication of the theoretical performance of buildings, it is well established that there is a 'performance gap' between design theory and measured reality.

1.2.2 To address this gap the London Plan Policy SI 2 ‘Minimising greenhouse gas emissions’ introduces a fourth stage to the energy hierarchy; the ‘be seen’ stage, which requires monitoring and reporting of the actual operational energy performance of major developments for at least five years via the Mayor’s ‘be seen’ monitoring portal.

1.2.3 The ‘be seen’ policy establishes post-construction monitoring as good practice, enabling developers and building owners to better understand their buildings and identify methods for improving energy performance from the project inception stage and throughout the building’s lifetime.

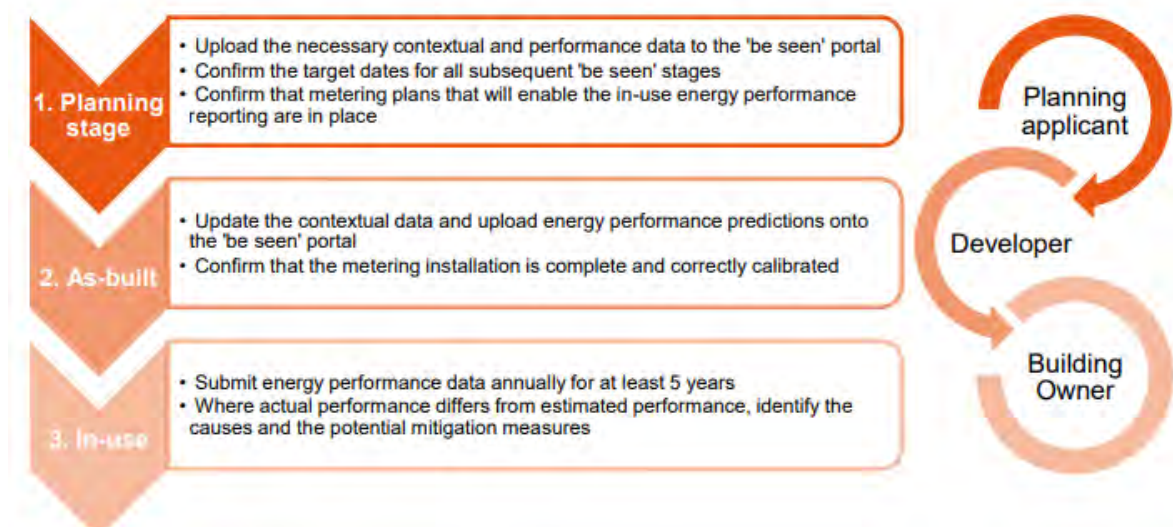
1.2.4 Ensuring that the actual energy and carbon performance of buildings is aligned with the estimated energy and carbon performance will also be a key factor in achieving a zero-carbon London.

1.2.5 The energy performance data that will be collected will provide an evidence base which could help inform future industry-wide benchmarks or performance ratings for major building typologies based on in-use performance

1.2.6 An effectively implemented post-construction monitoring regime can have a number of benefits including environmental (for example, carbon emissions reduction) and socio-economic (for example, reduced occupants’ bills, raised awareness around energy usage).

Figure 4 outlines the ‘be seen’ process through the reporting stages of a development

Figure 4. ‘Be seen’ process and responsibilities



Smart metering equipment will be installed with display of energy usage and generation to raise awareness of occupants. This can help occupants to reduce demand and subsequent running costs. The GLA spreadsheet informs the planning stage energy performance data including carbon offset. An on-site operational manual will be provided for the occupants on completion of the build to assist residents better understanding of appliances and cost management.

5. SUSTAINABILITY STRATEGY

a. Sustainable Design

London Plan Policy 5.3 Sustainable Design and Construction and Sustainable Design and Construction SPG (2014) to consider the following principles:

- a. Minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems)
- b. Avoiding internal overheating and contributing to the urban heat island effect
- c. Efficient use of natural resources (including water), including making the most of natural systems both within and around buildings
- d. Minimising pollution (including noise, air and urban runoff)
- e. Minimising the generation of waste and maximising reuse or recycling
- f. Avoiding impacts from natural hazards (including flooding)
- g. Ensuring developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions
- h. Securing sustainable procurement of materials, using local supplies where feasible, and
- i. Promoting and protecting biodiversity and green infrastructure.

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 2021.

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

Policy SI 4 Managing Heat Risk

- A. Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.

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, reduced cold bridging, green roof & wall elements and light coloured materials.

Table 10. Thermal Elements Performance

Element	
Solar Shading	External and Internal shading
Ventilation	Passive
Wall	0.15 W/m ² k
Roof	0.11 W/m ² k
Floor	0.18 W/m ² k
Glazing	U-value: 0.8 W/m ² k G-value: 1.6 W/m ² k
Air Permeability	Residential: 3 Commercial: 8

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 5. Internal layout of Ground Floor (commercial) and First Floor (residential)



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 11. 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:

- Use of eco-friendly building materials
- Non-toxic paints
- Installation of energy efficient appliances and devices
- 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;

Pre-demolition Survey Results

- **Main Building: 80% Recyclable**
 - **Wood - (17 02 01)**
 - Window Frames, Doors, Frames around fibreglass signage on outside walls
 - **Plastic - (17 02 03)**
 - PVC Windows and frames, Drain Pipes, Gutters, Roof Facias around the top of the building
 - **Metal - (17 04 02) (17 04 05)**
 - Roof fringing surrounding the top perimeter of the building, Security poles, Heavy stand for the MOT light up sign in the existing car park, Flat wall signs, Copper pipes, Blue bi-fold doors to the smaller entrance to the main building, the steel frame/lintels in between the inside drywalls and outside walls, Steel shutters rolling to main workshop
 - **Inert/Rubble - (17 01 01) (17 01 02)**
 - Bricks and concrete of the main carcass of the building
 - **Glass - (17 02 02)**
 - Windows
- **The Outside Building: 80% Recyclable**
 - **Wood - (17 02 01) (20 01 38)**
 - Window frame and doors
 - **Metal - (16 01 18) (16 01 17). (16 07 99) (17 04 11)**
 - Storage tank, door handles, pipes and taps, cables running outside from the outside building to main building
 - **Inert/Rubble - (17 01 07) (17 09 04) (17 01 03) (17 01 02) (17 01 01)**
 - Bricks, Concrete, Tiles, Sink and Toilet
 - **Plastic - (17 02 03)**
 - Gutters, Plastic facias on top perimeter of the building

Operational Waste

A space for reuse and recycling has been included for the residents exclusive use.

f. Flood Risk

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%.

h. Biodiversity and Green Infrastructure

In accordance with London Plan Policy 5.3 Sustainable Design and Construction, the highest standards should be achieved in London to improve the environmental performance of new developments and to adapt to the effects of climate change over their lifetime. This section investigates how the development proposal considers sustainable design principles set out in the Sustainable Design and Construction SPG (2014).

In accordance with London Plan Policy 5.11 major development proposals should be designed to include roof, wall and site planting. Particularly green roofs and walls where feasible. Vegetated roofs, including terraces and gardens, can improve the thermal performance of the building, reduce the urban heat island effect, support sustainable urban drainage by absorbing rainfall to reduce flooding, enhance biodiversity, provide amenity for residents who may not have access to private gardens, provide opportunities to grow food and improve appearance.

Biodiversity

The proposed development will incorporate measures to support and enhance the environment through consideration of the existing site, including measures to mitigate the impact of the development and enhance site biodiversity.

The existing site is a brownfield site with a baseline biodiversity score of 0. The site has potential to incorporate measures to increase on-site biodiversity and add to the biodiversity infrastructure of the area. As the site location within the borough is adjacent to an Ecological Corridor, it holds importance in supporting this infrastructure. There are some site constraints in that there is little to no amenity space. However, the surface area of the development has great potential for incorporating biodiversity measures such as green roofs and walls, which can help to attract pollinators and other local wildlife, to aid in supporting the nearby Ecological Corridor.

i. Urban Greening

Urban Greening Factor

The scheme has an UGF of 0.4. The table below summarise the measures to be implemented within the development.

Table 12. Urban Greening Factor Calculator

Urban Greening Factor Calculator				
Surface Cover Type	Factor	Area (m ²)	Contribution	Notes
Semi-natural vegetation (e.g. trees, woodland, species-rich grassland) maintained or established on site.	1	0	0	
Wetland or open water (semi-natural; not chlorinated) maintained or established on site.	1	0	0	
Intensive green roof or vegetation over structure. Substrate minimum settled depth of 150mm.	0.8	55	44	
Standard trees planted in connected tree pits with a minimum soil volume equivalent to at least two thirds of the projected canopy area of the mature tree.	0.8	0	0	
Extensive green roof with substrate of minimum settled depth of 80mm (or 60mm beneath vegetation blanket) – meets the requirements of GRO Code 2014.	0.7	0	0	
Flower-rich perennial planting.	0.7	0	0	
Rain gardens and other vegetated sustainable drainage elements.	0.7	0	0	
Hedges (line of mature shrubs one or two shrubs wide).	0.6	0	0	
Standard trees planted in pits with soil volumes less than two thirds of the projected canopy area of the mature tree.	0.6	0	0	
Green wall –modular system or climbers rooted in soil.	0.6	155	93	
Groundcover planting.	0.5	0	0	
Amenity grassland (species-poor, regularly mown lawn).	0.4	0	0	
Extensive green roof of sedum mat or other lightweight systems that do not meet GRO Code 2014.	0.3	0	0	
Water features (chlorinated) or unplanted detention basins.	0.2	0	0	
Permeable paving.	0.1	0	0	
Sealed surfaces (e.g. concrete, asphalt, waterproofing, stone).	0	1	0	
Total contribution			137	
Total site area (m²)			390	
Urban Greening Factor			0.4	

6. OVERHEATING ASSESSMENT

a. Cooling Hierarchy

Policy SI 4 Managing Heat Risk

- B. Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:
- 1) Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
 - 2) Minimise internal heat generation through energy efficient design
 - 3) Manage the heat within the building through exposed internal thermal mass and high ceilings
 - 4) Provide passive ventilation
 - 5) Provide mechanical ventilation
 - 6) Provide active cooling systems

The hierarchy, in relation to the development is explored below.

A dynamic assessment has been undertaken to determine if the dwellings within the development are at risk of overheating under current and future climate conditions spanning the anticipated lifetime of the building.

1. Reduce the amount of the heat entering a building in summer

The orientation of the building has been designed to reduce the amount of the heat entering the building in summer. Internal shading such as blinds could be used within the space. Green walls and roofs will help to reduce the amount of heat being absorbed.

2. Minimise internal heat generation through energy efficient design

Internal heat generation is minimised through energy efficient design

3. Manage the heat within the building

The building will be designed to as a high thermal mass, which may help to limit the internal temperature.

4. Passive ventilation

The results of the modelling confirm that the overheating criteria will be met with the use of passive ventilation to achieve thermal comfort for the users. The commercial spaces are single aspect and the residential units are majority dual aspect rooms providing opportunities for cross ventilation.

5. Mechanical ventilation

The results of the modelling confirm that there is no need for mechanical ventilation. Details are presented in section's b and c below.

6. Active cooling

The results of the modelling confirm there is no need for cooling system. Details are presented in the section's b and c below.

The performance of the units has been assessed to assess the current situation, a model has been carried out in accordance with the criteria set out in CIBSE TM52, TM59 AND TM49. Results are presented in the following two sections.

b. TM52

The CIBSE TM52 methodology was used in assessment of overheating risk for commercial units. The units are required to pass the below criteria:

Criterion 1: The first criterion sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by 1 K or more during the occupied hours of a typical non-heating season (1 May to 30 September).

Criterion 2: The second criterion deals with the severity of overheating within any one day, which can be as important as its frequency, the level of which is a function of both temperature rise and its duration. This criterion sets a daily limit for acceptability.

Criterion 3: The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable.

Building Category: Category II - all units: Normal expectation

Results

All zones pass all three of the above criteria showing an acceptable level of overheating risk (full tables of results in Appendix 2).

c. TM59 & TM49

As the buildings will be predominantly naturally ventilated, the CIBSE TM59 methodology was used for the assessment of overheating in residential buildings.

Naturally Ventilated Buildings: The criteria below can be applied to homes which are naturally ventilated buildings. The compliance is based on passing both of the following two criteria.

1. Living rooms, Kitchens and Bedrooms: The number of hours (h) during which Δ is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours. Please refer to CIBSE TM59.
2. Bedrooms only: The operative temperature in the bedroom between 10:00pm to 7:00am shall not exceed 26°C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26°C will be recorded as a fail).

The CIBSE TM49 methodology was also used in line with guidance from the Greater London Authority to assess summertime overheating risk. 3 weather files from the CIBSE TM49 document have been used:

- London_GTW_DSY1 - London Gatwick Weather data: 2020 Moderately warm summer
- London_GTW_DSY2 - London Gatwick Weather data: 2050 featuring short intense warm spell
- London_GTW_DSY3 - London Gatwick Weather data: 2080 featuring long, less intense warm spell

Building Category: Category II - all units: Normal expectation

Window Openings: Glazed doors are modelled as 100% openable.

Lighting Gain: The internal gains from the lighting are based on CIBSE TM59 5.2

Small Power Gains

The house is modelled to include small power gains that are representative of typical equipment use in an everyday occurrence. There are associated with an assumed usage profile to represent which times of the day such appliances would result in a heat gain into the space. Small power gains include appliances such as TV's, fridge/freezers, toasters, kettles, hairdryers etc.

A list of anticipated heat gains in the dwellings are:

- Kitchen and Living spaces: 250W maximum power consumption
- Bedroom spaces: 150W maximum power consumption

Results

All zones and rooms in the residential building pass both criteria of TM59 and TM49 demonstrating an acceptable level of overheating risk (full tables of results in Appendix 2).

d. Summary

Results show that the units demonstrate an acceptable level of overheating risk against the CIBSE TM52, TM59 and TM49 with the use of passive ventilation. Therefore, there is no need to implement active cooling.

Furthermore, the development proposal will minimise adverse impacts on the urban heat island through the use of optimised insulation, cross ventilation, improved window u-values, higher air tightness, reduced cold bridging, green infrastructure and light coloured materials.

7. 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 **89%** from the notional emissions once energy efficiency measures and lean measures are taken into account.

The use of air source heat pumps and photovoltaic panels are to be incorporated in the design because they achieve a CO₂ percentage reduction of **23%** contributing to the overall reduction of **89%** in carbon emissions. The remainder is made up from a fabric first approach with U-values outlined in the specification column of Table 4 on Page 10 of this report.

Overall energy performance:

Residential units, predicted EPC range is B88 to B91.

Commercial units, predicted EPC A8 and A7.

Drawings are provided in the Appendix indicating the location of the solar photovoltaic panels, heat pumps and the rooftop enclosure provided for all plant. Plant area shown in rooftop plan in Appendix 3.

Fabric Performance

Element	U-value Specification
External Walls	0.15 W/m ² k
Roof	0.11 W/ m ² k
Floor	0.18 W/m ² k
Windows & Doors	0.8 W/m ² k
Residential Air Permeability	3 m ³ /hm ²
Commercial Air Permeability	8 m ³ /hm ²

Energy Performance

Solar Photovoltaic Panels (roof plan in Appendix)				
	System size	Pitch	Orientation	Degree
Residential	13.25 kWp	Horizontal	South facing	n/a
Commercial	8.26 kWp	n/a	South facing	15

Residential Air Source Heat Pump GD Midea MHC-V6W/D2N8-B (plant area shown on roof plan in Appendix)			
Seasonal Coefficient of Performance (SCOP) (W/W)		Seasonal Energy Efficiency Ratio (SEER) (W/W)	
Water at 35°	Water at 55°	Water at 7°	Water at 18°
4.95	3.52	5.34	8.21
Built in Cylinder - 200L Time and Temperature Zone Controller			

Commercial Heatpump (plant area shown on roof plan in Appendix)		
EER	COP	SEER
3.50	3.50	6.50

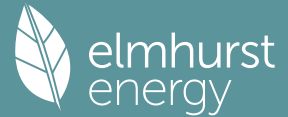
An appraisal of the proposed development has been undertaken against key sustainability objectives identified from relevant policy guidance. The framework for the appraisal was guided by the National Plan. This process has ensured that the development responds to the sustainable development objectives 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.

8. APPENDIX

- 1a. Baseline SAP/SBEM Calculations
- 1b. Be Lean SAP/SBEM Calculations
- 1c. Be Green SAP/SBEM Calculations
- 2. Full Overheating Calculations
- 3. Roof Plan

1a. Baseline SAP/SBEM Calculations

Full SAP Calculation Printout



Property Reference	13 Bedford Road_Copy			Issued on Date	27/02/2024
Assessment Reference	Flat 5 - Heatpump+PV Baseline	Prop Type Ref	13 Bedford Road		
Property	Flat 1, 13 Bedford Road, LONDON, N22 7AU				
SAP Rating	83 B	DER	4.54	TER	13.24
Environmental	97 A	% DER < TER			65.71
CO ₂ Emissions (t/year)	0.25	DFEE	27.33	TFEE	29.08
Compliance Check	See BREL	% DFEE < TFEE			6.03
% DPER < TPER	32.28	DPER	48.12	TPER	71.05
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	61.0000 (1b)	2.6000 (2b)	158.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0000		158.6000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	158.6000 (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) = 0.1261 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2761 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2761 (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	0.3520	0.3451	0.3382	0.3037	0.2968	0.2623	0.2623	0.2554	0.2761	0.2968	0.3106	0.3244 (22b)
Effective ac	0.5620	0.5596	0.5572	0.5461	0.5440	0.5344	0.5344	0.5326	0.5381	0.5440	0.5482	0.5526 (25)

3. Heat losses and heat loss parameter

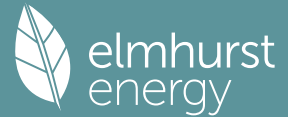
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
ENTRANCE DOOR			2.3400	1.0000	2.3400		(26)
WINDOWS (Uw = 1.00)			15.6000	0.9615	15.0000		(27)
EXTERNAL	56.1300	17.9400	38.1900	0.1600	6.1104	70.0000	2673.3000 (29a)
Total net area of external elements Aum(A, m ²)			56.1300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4504		(33)
Party Wall 1			32.7900	0.0000	0.0000	180.0000	5902.2000 (32)
Party Floor 1			61.0000			40.0000	2440.0000 (32d)
Party Ceiling 1			61.0000			30.0000	1830.0000 (32b)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 12845.5000 (34)
210.5820 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.2000	0.3000	2.4600
E3 Sill	4.0300	0.0400	0.1612
E4 Jamb	26.6600	0.0500	1.3330
E7 Party floor between dwellings (in blocks of flats)	43.1800	0.0700	3.0226
E16 Corner (normal)	7.8000	0.0900	0.7020
E17 Corner (inverted - internal area greater than external area)	5.2000	-0.0900	-0.4680
E18 Party wall between dwellings	10.4000	0.0600	0.6240

Full SAP Calculation Printout



P3 Party wall - Intermediate floor between dwellings (in blocks of flats) 29.2200 0.0000 0.0000
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8348 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 31.2852 (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 29.4120 29.2861 29.1627 28.5829 28.4744 27.9694 27.9694 27.8759 28.1639 28.4744 28.6939 28.9233 (38)
 60.6972 60.5713 60.4479 59.8681 59.7596 59.2546 59.2546 59.1611 59.4491 59.7596 59.9791 60.2085 (39)
 Average = Sum(39)m / 12 = 59.8676

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 HLP (average) 0.9950 0.9930 0.9909 0.9814 0.9797 0.9714 0.9714 0.9699 0.9746 0.9797 0.9833 0.9870 (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 2.0098 (42)
 Hot water usage for mixer showers 57.9167 57.0463 55.7780 53.3513 51.5605 49.5634 48.4282 49.6869 51.0667 53.2110 55.6898 57.6948 (42a)
 Hot water usage for baths 26.3466 25.9553 25.4043 24.3884 23.6276 22.7841 22.3284 22.8756 23.4714 24.3740 25.4109 26.2576 (42b)
 Hot water usage for other uses 37.0652 35.7174 34.3696 33.0218 31.6739 30.3261 30.3261 31.6739 33.0218 34.3696 35.7174 37.0652 (42c)
 Average daily hot water use (litres/day) 111.5204 (43)
 Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 Energy conte 121.3286 118.7191 115.5519 110.7615 106.8621 102.6736 101.0828 104.2365 107.5598 111.9546 116.8181 121.0176 (44)
 Energy content (annual) 192.1548 169.0544 177.5990 151.6269 143.8569 126.2492 122.2509 129.0665 132.6320 151.9213 166.4288 189.4843 (45)
 Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1852.3250
 28.8232 25.3582 26.6399 22.7440 21.5785 18.9374 18.3376 19.3600 19.8948 22.7882 24.9643 28.4226 (46)
 Water storage loss:
 Store volume 200.0000 (47)
 a) If manufacturer declared loss factor is known (kWh/day): 2.1000 (48)
 Temperature factor from Table 2b 0.5400 (49)
 Enter (49) or (54) in (55) 1.1340 (55)
 Total storage loss
 35.1540 31.7520 35.1540 34.0200 35.1540 34.0200 35.1540 35.1540 34.0200 35.1540 34.0200 35.1540 (56)
 If cylinder contains dedicated solar storage
 35.1540 31.7520 35.1540 34.0200 35.1540 34.0200 35.1540 35.1540 34.0200 35.1540 34.0200 35.1540 (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
 250.5712 221.8176 236.0154 208.1589 202.2733 182.7812 180.6673 187.4829 189.1640 210.3377 222.9608 247.9007 (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
 250.5712 221.8176 236.0154 208.1589 202.2733 182.7812 180.6673 187.4829 189.1640 210.3377 222.9608 247.9007 (64)
 Total per year (kWh/year) = Sum(64)m = 2540.1310 (64)
 2540 (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
 110.6246 98.4211 105.7848 95.6415 94.5655 87.2034 87.3815 89.6477 89.3258 97.2470 100.5632 109.7367 (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 88.4945 97.9760 88.4945 91.4443 88.4945 91.4443 88.4945 88.4945 91.4443 88.4945 91.4443 88.4945 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 175.4617 177.2825 172.6943 162.9265 150.5964 139.0079 131.2661 129.4454 134.0336 143.8013 156.1314 167.7199 (68)
 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 (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) -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 (71)
 Water heating gains (Table 5) 148.6890 146.4600 142.1839 132.8355 127.1042 121.1159 117.4483 120.4943 124.0635 130.7083 139.6711 147.4955 (72)
 Total internal gains 465.7916 474.8650 456.5190 440.3527 419.3416 404.7146 390.3553 391.5805 402.6878 416.1505 440.3932 456.8563 (73)

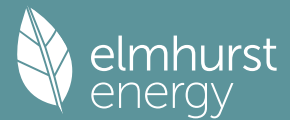
6. Solar gains

[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 2.5600 10.6334 0.5700 0.7000 7.5269 (74)
 East 8.5100 19.6403 0.5700 0.7000 46.2150 (76)
 South 4.5300 46.7521 0.5700 0.7000 58.5605 (78)
 Solar gains 112.3025 200.6978 295.4975 394.4799 462.8885 467.5045 447.5054 396.1058 330.1684 227.8422 136.3243 94.8815 (83)
 Total gains 578.0941 675.5628 752.0166 834.8326 882.2301 872.2191 837.8607 787.6863 732.8562 643.9928 576.7175 551.7378 (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	58.7868	58.9090	59.0293	59.6009	59.7091	60.2180	60.2180	60.3132	60.0210	59.7091	59.4907	59.2640
alpha	4.9191	4.9273	4.9353	4.9734	4.9806	5.0145	5.0145	5.0209	5.0014	4.9806	4.9660	4.9509
util living area	0.9719	0.9432	0.8883	0.7686	0.6050	0.4310	0.3106	0.3444	0.5458	0.8176	0.9444	0.9768 (86)
Living	20.5768	20.6361	20.7035	20.7701	20.8020	20.8129	20.8144	20.8145	20.8089	20.7640	20.6626	20.5668
Non living	19.5788	19.6534	19.7359	19.8185	19.8519	19.8685	19.8693	19.8708	19.8628	19.8156	19.6950	19.5726
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	20.7835	20.6361	20.7035	20.7701	20.8020	20.8129	20.8144	20.8145	20.8089	20.7640	20.6626	20.6274 (87)
Th 2	20.0875	20.0892	20.0909	20.0988	20.1003	20.1072	20.1072	20.1085	20.1046	20.1003	20.0973	20.0942 (88)
util rest of house	0.9652	0.9309	0.8660	0.7303	0.5537	0.3724	0.2479	0.2782	0.4802	0.7763	0.9302	0.9712 (89)
MIT 2	19.8847	19.6534	19.7359	19.8185	19.8519	19.8685	19.8693	19.8708	19.8628	19.8156	19.6950	19.6666 (90)
Living area fraction												0.4098 (91)
MIT	20.2530	20.0561	20.1325	20.2085	20.2413	20.2555	20.2567	20.2576	20.2505	20.2043	20.0916	20.0604 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2530	20.0561	20.1325	20.2085	20.2413	20.2555	20.2567	20.2576	20.2505	20.2043	20.0916	20.0604 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9666	0.9304	0.8672	0.7352	0.5620	0.3823	0.2584	0.2893	0.4911	0.7815	0.9301	0.9710 (94)
Useful gains	558.7594	628.5568	652.1131	613.7924	495.7747	333.4077	216.4921	227.8958	359.8950	503.2719	536.3951	535.7166 (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	968.3056	918.0268	824.0539	677.0193	510.4234	335.1170	216.6744	228.2185	365.6423	573.9510	779.2217	954.9287 (97)
Space heating kWh	304.7024	194.5238	127.9240	45.5234	10.8987	0.0000	0.0000	0.0000	0.0000	52.5853	174.8351	311.8938 (98a)
Space heating requirement - total per year (kWh/year)												1222.8865
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	304.7024	194.5238	127.9240	45.5234	10.8987	0.0000	0.0000	0.0000	0.0000	52.5853	174.8351	311.8938 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1222.8865
Space heating per m2										(98c) / (4) =		20.0473 (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 %)												310.2999 (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	304.7024	194.5238	127.9240	45.5234	10.8987	0.0000	0.0000	0.0000	0.0000	52.5853	174.8351	311.8938 (98)
Space heating efficiency (main heating system 1)	310.2999	310.2999	310.2999	310.2999	310.2999	0.0000	0.0000	0.0000	0.0000	310.2999	310.2999	310.2999 (210)
Space heating fuel (main heating system)	98.1961	62.6890	41.2259	14.6708	3.5123	0.0000	0.0000	0.0000	0.0000	16.9466	56.3439	100.5137 (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	250.5712	221.8176	236.0154	208.1589	202.2733	182.7812	180.6673	187.4829	189.1640	210.3377	222.9608	247.9007 (64)
Efficiency of water heater	176.8270	176.8270	176.8270	176.8270	176.8270	176.8270	176.8270	176.8270	176.8270	176.8270	176.8270	176.8270 (216)
Fuel for water heating, kWh/month	141.7041	125.4433	133.4725	117.7190	114.3905	103.3672	102.1718	106.0262	106.9769	118.9511	126.0898	140.1939 (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	17.9560	14.4049	12.9701	9.5024	7.3399	5.9968	6.6957	8.7034	11.3048	14.8325	16.7533	18.4550 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-1.4641	-2.6707	-5.0791	-7.3702	-9.4455	-9.4023	-9.1914	-7.7862	-5.6894	-3.5288	-1.7754	-1.1889 (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												394.0982 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												176.8270
Water heating fuel used												1436.5063 (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)												144.9149 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-64.5921 (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	1910.9273 (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	394.0982	0.1576	62.1017 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1436.5063	0.1408	202.2631 (264)
Space and water heating			264.3648 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	144.9149	0.1443	20.9157 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-64.5921	0.1301	-8.4003
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-8.4003 (269)
Total CO2, kg/year			276.8802 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5400 (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	394.0982	1.5833	623.9804 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1436.5063	1.5206	2184.3951 (278)
Space and water heating			2808.3755 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	144.9149	1.5338	222.2753 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-64.5921	1.4804	-95.6208
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-95.6208 (283)
Total Primary energy kWh/year			2935.0300 (286)
Dwelling Primary energy Rate (DPER)			48.1200 (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	61.0000 (1b)	x 2.6000 (2b)	= 158.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.6000 (5)

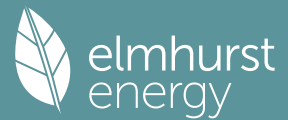
2. Ventilation rate

	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) =	0.1261 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3761	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3761 (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	0.4795	0.4701	0.4607	0.4137	0.4043	0.3573	0.3573	0.3479	0.3761	0.4043	0.4231	0.4419 (22b)
Effective ac	0.6150	0.6105	0.6061	0.5856	0.5817	0.5638	0.5638	0.5605	0.5707	0.5817	0.5895	0.5976 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3400	1.0000	2.3400			(26)
TER Opening Type (Uw = 1.20)			12.9100	1.1450	14.7824			(27)
EXTERNAL	56.1300	15.2500	40.8800	0.1800	7.3584			(29a)
Total net area of external elements Aum(A, m2)			56.1300					(31)
Fabric heat loss, W/K = Sum (A x U)								(33)
Party Wall 1			32.7900	0.0000	0.0000			(32)

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

220.5820 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	8.2000	0.0500	0.4100	
E2 Other lintels (including other steel lintels)	4.0300	0.0500	0.2015	
E3 Sill	26.6600	0.0500	1.3330	
E4 Jamb	43.1800	0.0700	3.0226	
E7 Party floor between dwellings (in blocks of flats)	7.8000	0.0900	0.7020	
E16 Corner (normal)	5.2000	-0.0900	-0.4680	
E17 Corner (inverted - internal area greater than external area)	10.4000	0.0600	0.6240	
E18 Party wall between dwellings	29.2200	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				

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

5.8251 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 30.3059 (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	32.1866	31.9529	31.7239	30.6481	30.4468	29.5098	29.5098	29.3363	29.8707	30.4468	30.8540	31.2797	(38)
Average = Sum(39)m / 12 =	62.4925	62.2589	62.0298	60.9540	60.7527	59.8157	59.8157	59.6422	60.1766	60.7527	61.1599	61.5856	(39)
												60.9530	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0245	1.0206	1.0169	0.9992	0.9959	0.9806	0.9806	0.9777	0.9865	0.9959	1.0026	1.0096	(40)
HLP (average)												0.9992	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

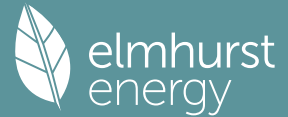
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0098 (42)
Hot water usage for mixer showers	57.9167	57.0463	55.7780	53.3513	51.5605	49.5634	48.4282	49.6869	51.0667	53.2110	55.6898	57.6948 (42a)	
Hot water usage for baths	25.0293	24.6576	24.1341	23.1690	22.4462	21.6449	21.2120	21.7318	22.2978	23.1553	24.1403	24.9447 (42b)	
Hot water usage for other uses	35.2120	33.9315	32.6511	31.3707	30.0902	28.8098	28.8098	30.0902	31.3707	32.6511	33.9315	35.2120 (42c)	
Average daily hot water use (litres/day)												108.6142 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	118.1580	115.6354	112.5632	107.8910	104.0970	100.0181	98.4501	101.5090	104.7352	109.0174	113.7617	117.8515 (44)	
Energy content (annual)	187.1333	164.6633	173.0055	147.6973	140.1346	122.9839	119.0668	125.6893	129.1490	147.9356	162.0744	184.5269 (45)	
Distribution loss (46)m = 0.15 x (45)m	28.0700	24.6995	25.9508	22.1546	21.0202	18.4476	17.8600	18.8534	19.3723	22.1903	24.3112	27.6790 (46)	
Water storage loss:													
Store volume												200.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.6525 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.8924 (55)	
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (56)	
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637 (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	238.0594	210.6611	223.9316	196.9806	191.0606	172.2672	169.9929	176.6154	178.4322	198.8617	211.3577	235.4530 (62)	
WWHRS	-26.4771	-23.4166	-24.5205	-20.3039	-18.9225	-16.1921	-15.1775	-16.1398	-16.7530	-19.7500	-22.3743	-25.9868 (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	211.5823	187.2445	199.4111	176.6767	172.1381	156.0751	154.8153	160.4756	161.6792	179.1117	188.9834	209.4662 (64)	
12Total per year (kWh/year)												2157.6593 (64)	
Electric shower(s)												2158 (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	102.9627	91.5488	98.2652	88.5360	87.3356	80.3188	80.3306	82.5326	82.3687	89.9294	93.3164	102.0961 (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	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	88.6967	98.1999	88.6967	91.6532	88.6967	91.6532	88.6967	88.6967	91.6532	88.6967	91.6532	88.6967	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.4617	177.2825	172.6943	162.9265	150.5964	139.0079	131.2661	129.4454	134.0336	143.8013	156.1314	167.7199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	(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)	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	(71)
Water heating gains (Table 5)	138.3907	136.2333	132.0769	122.9667	117.3866	111.5539	107.9712	110.9309	114.4009	120.8729	129.6061	137.2259	(72)
Total internal gains	458.6956	467.8621	449.6143	433.6928	412.8261	395.3615	381.0804	382.2194	393.2342	409.5174	433.5371	449.7889	(73)

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North	2.1200				10.6334		0.6300		0.7000	0.7700	6.8894 (74)
East	7.0400				19.6403		0.6300		0.7000	0.7700	42.2563 (76)
South	3.7500				46.7521		0.6300		0.7000	0.7700	53.5801 (78)
Solar gains	102.7258	183.5788	270.2838	360.8115	423.3769	427.5977	409.3061	362.2965	301.9929	208.4053	86.7910 (83)
Total gains	561.4214	651.4408	719.8981	794.5043	836.2030	822.9592	790.3865	744.5158	695.2271	617.9227	536.5800 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.8094	60.0339	60.2555	61.3190	61.5222	62.4859	62.4859	62.6677	62.1111	61.5222	61.1126	60.6901
alpha	4.9873	5.0023	5.0170	5.0879	5.1015	5.1657	5.1657	5.1778	5.1407	5.1015	5.0742	5.0460
util living area												
	0.9785	0.9561	0.9115	0.8032	0.6430	0.4604	0.3322	0.3672	0.5795	0.8453	0.9559	0.9821 (86)
MIT	20.0175	20.2451	20.5158	20.8013	20.9454	20.9920	20.9988	20.9980	20.9753	20.7810	20.3681	19.9879 (87)
Th 2	20.0630	20.0662	20.0693	20.0840	20.0867	20.0995	20.0995	20.1019	20.0946	20.0867	20.0811	20.0753 (88)
util rest of house												
	0.9730	0.9457	0.8916	0.7658	0.5893	0.3976	0.2646	0.2962	0.5102	0.8057	0.9437	0.9775 (89)
MIT 2	18.9438	19.2286	19.5589	19.8962	20.0438	20.0951	20.0991	20.1012	20.0790	19.8853	19.3967	18.9160 (90)
Living area fraction										fLA = Living area /	(4) =	0.4098 (91)
MIT	19.3839	19.6452	19.9510	20.2671	20.4133	20.4627	20.4678	20.4687	20.4463	20.2524	19.7948	19.3553 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3839	19.6452	19.9510	20.2671	20.4133	20.4627	20.4678	20.4687	20.4463	20.2524	19.7948	19.3553 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9681	0.9402	0.8888	0.7737	0.6090	0.4231	0.2924	0.3253	0.5376	0.8135	0.9391	0.9730 (94)
Useful gains	543.4875	612.4549	639.8499	614.7442	509.2709	348.2133	231.0710	242.1751	373.7837	502.6594	524.2403	522.1061 (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	942.6290	918.0173	834.3648	692.8727	529.3591	350.6808	231.3580	242.6686	381.9014	586.4094	776.4140	933.3471 (97)
Space heating kWh	296.9613	205.3379	144.7191	56.2525	14.9456	0.0000	0.0000	0.0000	0.0000	62.3100	181.5651	305.9633 (98a)
Space heating requirement - total per year (kWh/year)												1268.0548
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	296.9613	205.3379	144.7191	56.2525	14.9456	0.0000	0.0000	0.0000	0.0000	62.3100	181.5651	305.9633 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1268.0548
Space heating per m2										(98c) / (4) =		20.7878 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	296.9613	205.3379	144.7191	56.2525	14.9456	0.0000	0.0000	0.0000	0.0000	62.3100	181.5651	305.9633 (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)	321.7349	222.4680	156.7921	60.9453	16.1924	0.0000	0.0000	0.0000	0.0000	67.5081	196.7119	331.4879 (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	211.5823	187.2445	199.4111	176.6767	172.1381	156.0751	154.8153	160.4756	161.6792	179.1117	188.9834	209.4662 (64)
Efficiency of water heater	84.8199	84.2671	83.3526	81.8022	80.4514	79.8000	79.8000	79.8000	79.8000	81.9435	83.9701	79.8000 (216)
Fuel for water heating, kWh/month	249.4488	222.2036	239.2379	215.9803	213.9654	195.5828	194.0042	201.0973	202.6056	218.5795	225.0604	246.6968 (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	18.4294	14.7848	13.3120	9.7530	7.5335	6.1549	6.8723	8.9329	11.6029	15.2236	17.1951	18.9416 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-11.5970	-17.5776	-27.1425	-32.8629	-37.5447	-35.8322	-35.4038	-32.3664	-27.4013	-21.1006	-13.1800	-9.8888 (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)	-3.2890	-7.1381	-14.6058	-22.5661	-30.4636	-30.8340	-30.4649	-25.5000	-18.3139	-10.4026	-4.4526	-2.5844 (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)

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	1373.8405	1.1300	1552.4397 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	2624.4625	1.1300	2965.6426 (278)
Space and water heating			4518.0824 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	148.7360	1.5338	228.1362 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-301.8979	1.4918	-450.3715
PV Unit electricity exported	-200.6150	0.4591	-92.1033
Total			-542.4748 (283)
Total Primary energy kWh/year			4333.8446 (286)
Target Primary Energy Rate (TPER)			71.0500 (287)

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Property Reference	13 Bedford Road_Copy			Issued on Date	27/02/2024
Assessment Reference	Flat 4 - Heatpump+PV Baseline	Prop Type Ref	13 Bedford Road		
Property	Flat 1, 13 Bedford Road, LONDON, N22 7AU				
SAP Rating	83 B	DER	4.08	TER	11.92
Environmental	96 A	% DER < TER			65.77
CO ₂ Emissions (t/year)	0.32	DFEE	29.54	TFEE	31.13
Compliance Check	See BREL	% DFEE < TFEE			5.12
% DPER < TPER	32.24	DPER	43.08	TPER	63.58
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	87.0000	2.6000	226.2000
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		
Dwelling volume			226.2000

2. Ventilation rate

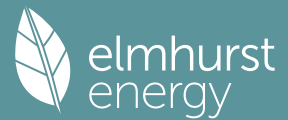
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.0884 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2384 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2384 (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	0.3040	0.2980	0.2921	0.2623	0.2563	0.2265	0.2265	0.2205	0.2384	0.2563	0.2682	0.2801 (22b)
Effective ac	0.5462	0.5444	0.5426	0.5344	0.5328	0.5257	0.5257	0.5243	0.5284	0.5328	0.5360	0.5392 (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
ENTRANCE DOOR			2.3400	1.0000	2.3400		(26)
WINDOWS (Uw = 1.00)			25.5000	0.9615	24.5192		(27)
EXTERNAL	86.2100	27.8400	58.3700	0.1600	9.3392	70.0000	4085.9000 (29a)
External Roof 1	6.3100		6.3100	0.1100	0.6941	9.0000	56.7900 (30)
Total net area of external elements Aum(A, m ²)			92.5200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.8925		(33)
Party Wall 1			21.2700	0.0000	0.0000	180.0000	3828.6000 (32)
Party Floor 1			87.0000			40.0000	3480.0000 (32d)
Party Ceiling 1			80.6900			30.0000	2420.7000 (32b)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13871.9900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							159.4482 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				12.2600	0.3000	3.6780	
E3 Sill				4.8000	0.0400	0.1920	
E4 Jamb				27.9200	0.0500	1.3960	
E7 Party floor between dwellings (in blocks of flats)				58.6100	0.0700	4.1027	
E16 Corner (normal)				10.4000	0.0900	0.9360	
E18 Party wall between dwellings				5.2000	0.0600	0.3120	

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P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3600	0.0000	0.0000										
E14 Flat roof	7.7100	0.0400	0.3084										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												10.9251	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss									(33) + (36) + (36a) =			47.8176	(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	40.7718	40.6379	40.5066	39.8901	39.7747	39.2377	39.2377	39.1382	39.4445	39.7747	40.0081	40.2521	(38)
Average = Sum(39)m / 12 =	88.5895	88.4555	88.3243	87.7077	87.5923	87.0553	87.0553	86.9559	87.2622	87.5923	87.8257	88.0697	(39)
												87.7071	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0183	1.0167	1.0152	1.0081	1.0068	1.0006	1.0006	0.9995	1.0030	1.0068	1.0095	1.0123	(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													2.5824 (42)
Hot water usage for mixer showers													
Hot water usage for baths	67.5179	66.5033	65.0247	62.1958	60.1080	57.7799	56.4565	57.9239	59.5324	62.0322	64.9219	67.2593	(42a)
Hot water usage for other uses	30.6928	30.2370	29.5951	28.4115	27.5253	26.5426	26.0118	26.6492	27.3432	28.3947	29.6027	30.5890	(42b)
Average daily hot water use (litres/day)	43.2382	41.6659	40.0936	38.5213	36.9490	35.3767	35.3767	36.9490	38.5213	40.0936	41.6659	43.2382	(42c)
												130.0138	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	141.4489	138.4061	134.7133	129.1285	124.5823	119.6991	117.8450	121.5221	125.3969	130.5205	136.1904	141.0865	(44)
Energy content (annual)	224.0205	197.0885	207.0494	176.7705	167.7117	147.1840	142.5233	150.4697	154.6269	177.1151	194.0282	220.9073	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	33.6031	29.5633	31.0574	26.5156	25.1568	22.0776	21.3785	22.5705	23.1940	26.5673	29.1042	33.1361	(46)
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.1000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.1340 (55)
Total storage loss													
If cylinder contains dedicated solar storage	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(56)
Primary loss	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(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	282.4369	249.8517	265.4658	233.3025	226.1281	203.7160	200.9397	208.8861	211.1589	235.5315	250.5602	279.3237	(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	282.4369	249.8517	265.4658	233.3025	226.1281	203.7160	200.9397	208.8861	211.1589	235.5315	250.5602	279.3237	(64)
12Total per year (kWh/year)													2847.3011 (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	121.2199	107.7425	115.5770	104.0018	102.4973	94.1643	94.1221	96.7643	96.6390	105.6239	109.7400	120.1848	(65)

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

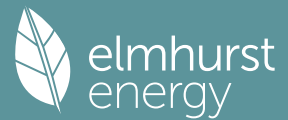
Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	117.7482	130.3641	117.7482	121.6731	117.7482	121.6731	117.7482	117.7482	121.6731	117.7482	121.6731	117.7482	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486	(68)
Pumps, fans	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	(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)	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	(71)
Total internal gains	162.9300	160.3311	155.3455	144.4469	137.7651	130.7837	126.5082	130.0595	134.2209	141.9676	152.4167	161.5387	(72)
	575.8631	588.3025	564.5965	544.6270	517.6153	499.1405	480.6397	481.7685	495.9594	512.7770	543.5559	564.1714	(73)

6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North	4.5000				10.6334		0.5700		0.7000		0.7700		13.2309 (74)	
East	10.3800				19.6403		0.5700		0.7000		0.7700		56.3704 (76)	
South	9.9000				46.7521		0.5700		0.7000		0.7700		127.9800 (78)	
West	0.7200				19.6403		0.5700		0.7000		0.7700		3.9101 (80)	
Solar gains	201.4914	352.8046	504.1560	653.9998	754.5250	757.4660	726.8775	651.4412	556.4242	396.0935	243.1846	171.1882	(83)	
Total gains	777.3545	941.1071	1068.7525	1198.6268	1272.1403	1256.6066	1207.5172	1133.2097	1052.3836	908.8705	786.7406	735.3595	(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	43.4965	43.5623	43.6271	43.9338	43.9916	44.2630	44.2630	44.3136	44.1581	43.9916	43.8747	43.7532
alpha	3.8998	3.9042	3.9085	3.9289	3.9328	3.9509	3.9509	3.9542	3.9439	3.9328	3.9250	3.9169
util living area	0.9597	0.9225	0.8613	0.7460	0.5955	0.4333	0.3149	0.3492	0.5432	0.7982	0.9284	0.9664 (86)
Living	20.4350	20.5145	20.6021	20.6895	20.7390	20.7599	20.7643	20.7639	20.7516	20.6814	20.5446	20.4196
Non living	19.3871	19.4864	19.5936	19.7001	19.7536	19.7783	19.7815	19.7823	19.7697	19.6952	19.5311	19.3725
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	20.7110	20.5145	20.6021	20.6895	20.7390	20.7599	20.7643	20.7639	20.7516	20.6814	20.5446	20.5008 (87)
Th 2	20.0681	20.0694	20.0707	20.0766	20.0777	20.0828	20.0828	20.0838	20.0808	20.0777	20.0754	20.0731 (88)
util rest of house	0.9522	0.9093	0.8392	0.7103	0.5468	0.3747	0.2503	0.2813	0.4797	0.7597	0.9138	0.9600 (89)
MIT 2	19.7966	19.4864	19.5936	19.7001	19.7536	19.7783	19.7815	19.7823	19.7697	19.6952	19.5311	19.4988 (90)
Living area fraction									FLA = Living area / (4) =			0.3333 (91)
MIT	20.1014	19.8291	19.9298	20.0299	20.0820	20.1055	20.1091	20.1095	20.0970	20.0240	19.8689	19.8328 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1014	19.8291	19.9298	20.0299	20.0820	20.1055	20.1091	20.1095	20.0970	20.0240	19.8689	19.8328 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9525	0.9055	0.8355	0.7084	0.5470	0.3761	0.2522	0.2832	0.4808	0.7572	0.9101	0.9581 (94)
Useful gains	740.4164	852.1628	892.9898	849.1120	695.9162	472.6479	304.4850	320.9580	506.0351	688.2191	715.9829	704.5759 (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	1399.8391	1320.5617	1186.1776	976.1769	734.2025	479.2827	305.4862	322.5657	523.3104	825.4665	1121.4369	1376.7755 (97)
Space heating kWh	490.6105	314.7641	218.1317	91.4867	28.4850	0.0000	0.0000	0.0000	0.0000	102.1120	291.9268	500.1165 (98a)
Space heating requirement - total per year (kWh/year)												2037.6334
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	490.6105	314.7641	218.1317	91.4867	28.4850	0.0000	0.0000	0.0000	0.0000	102.1120	291.9268	500.1165 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2037.6334
Space heating per m2										(98c) / (4) =		23.4211 (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 %)													307.1728 (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	490.6105	314.7641	218.1317	91.4867	28.4850	0.0000	0.0000	0.0000	0.0000	102.1120	291.9268	500.1165	(98)
Space heating efficiency (main heating system 1)	307.1728	307.1728	307.1728	307.1728	307.1728	0.0000	0.0000	0.0000	0.0000	307.1728	307.1728	307.1728	(210)
Space heating fuel (main heating system)	159.7181	102.4714	71.0127	29.7835	9.2733	0.0000	0.0000	0.0000	0.0000	33.2425	95.0367	162.8128	(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	282.4369	249.8517	265.4658	233.3025	226.1281	203.7160	200.9397	208.8861	211.1589	235.5315	250.5602	279.3237	(64)
Efficiency of water heater	175.6582	175.6582	175.6582	175.6582	175.6582	175.6582	175.6582	175.6582	175.6582	175.6582	175.6582	175.6582	(216)
Fuel for water heating, kWh/month	160.7878	142.2374	151.1264	132.8162	128.7319	115.9730	114.3924	118.9162	120.2101	134.0851	142.6408	159.0155	(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	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	26.7358	21.4485	19.3120	14.1488	10.9289	8.9290	9.9697	12.9590	16.8325	22.0851	24.9451	27.4789	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-1.4752	-2.6998	-5.1546	-7.5114	-9.6481	-9.6040	-9.3867	-7.9356	-5.7812	-3.5745	-1.7912	-1.1970	(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													663.3509 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													175.6582
Water heating fuel used													1620.9329 (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)													215.7734 (232)

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

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PV generation	-65.7592	(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	2434.2980	(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	663.3509	0.1571	104.1875 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	1620.9329	0.1409	228.3665 (264)
Space and water heating			332.5540 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	215.7734	0.1443	31.1428 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-65.7592	0.1300	-8.5490
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-8.5490 (269)
Total CO ₂ , kg/year			355.1478 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0800 (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	663.3509	1.5814	1049.0269 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1620.9329	1.5209	2465.3483 (278)
Space and water heating			3514.3752 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	215.7734	1.5338	330.9604 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-65.7592	1.4802	-97.3368
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-97.3368 (283)
Total Primary energy kWh/year			3747.9988 (286)
Dwelling Primary energy Rate (DPER)			43.0800 (287)

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

1. Overall dwelling characteristics

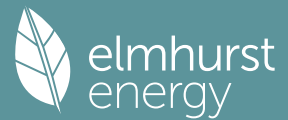
	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.0000 (1b)	x 2.6000 (2b)	= 226.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 226.2000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1326 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3826 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3826 (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	0.4878	0.4783	0.4687	0.4209	0.4113	0.3635	0.3635	0.3539	0.3826	0.4113	0.4305	0.4496 (22b)
Effective ac	0.6190	0.6144	0.6098	0.5886	0.5846	0.5661	0.5661	0.5626	0.5732	0.5846	0.5926	0.6011 (25)

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3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
TER Opaque door			2.3400	1.0000	2.3400			(26)
TER Opening Type (Uw = 1.20)			19.4200	1.1450	22.2366			(27)
EXTERNAL	86.2100	21.7600	64.4500	0.1800	11.6010			(29a)
External Roof 1	6.3100		6.3100	0.1100	0.6941			(30)
Total net area of external elements Aum(A, m ²)			92.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.8717			(33)
Party Wall 1			21.2700	0.0000	0.0000			(32)

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

168.7229 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	12.2600	0.0500	0.6130	
E2 Other lintels (including other steel lintels)	4.8000	0.0500	0.2400	
E3 Sill	27.9200	0.0500	1.3960	
E4 Jamb	58.6100	0.0700	4.1027	
E7 Party floor between dwellings (in blocks of flats)	10.4000	0.0900	0.9360	
E16 Corner (normal)	5.2000	0.0600	0.3120	
E18 Party wall between dwellings	16.3600	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.7100	0.0800	0.6168	
E14 Flat roof				8.2165 (36)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				0.0000
Point Thermal Bridges			(36a) =	
Total fabric heat loss			(33) + (36) + (36a) =	45.0882 (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	46.2057	45.8608	45.5227	43.9347	43.6376	42.2544	42.2544	41.9983	42.7872	43.6376	44.2386	44.8670	(38)
Heat transfer coeff	91.2940	90.9490	90.6109	89.0229	88.7258	87.3427	87.3427	87.0865	87.8754	88.7258	89.3269	89.9552	(39)
Average = Sum(39)m / 12 =												89.0215	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0494	1.0454	1.0415	1.0233	1.0198	1.0039	1.0039	1.0010	1.0101	1.0198	1.0267	1.0340	(40)
HLP (average)												1.0232	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

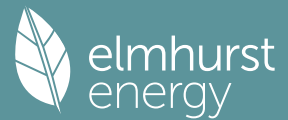
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5824 (42)
Hot water usage for mixer showers	67.5179	66.5033	65.0247	62.1958	60.1080	57.7799	56.4565	57.9239	59.5324	62.0322	64.9219	67.2593	(42a)
Hot water usage for baths	29.1581	28.7251	28.1153	26.9909	26.1490	25.2154	24.7112	25.3167	25.9760	26.9750	28.1225	29.0596	(42b)
Hot water usage for other uses	41.0763	39.5826	38.0889	36.5952	35.1015	33.6079	33.6079	35.1015	36.5952	38.0889	39.5826	41.0763	(42c)
Average daily hot water use (litres/day)													126.6255 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.7524	134.8110	131.2289	125.7819	121.3586	116.6032	114.7755	118.3421	122.1037	127.0961	132.6270	137.3951	(44)
Energy conte	218.1661	191.9690	201.6940	172.1891	163.3720	143.3772	138.8111	146.5323	150.5660	172.4682	188.9515	215.1275	(45)
Energy content (annual)										Total = Sum(45)m =		2103.2239	
Distribution loss (46)m = 0.15 x (45)m	32.7249	28.7954	30.2541	25.8284	24.5058	21.5066	20.8217	21.9798	22.5849	25.8702	28.3427	32.2691	(46)
Water storage loss:													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6525 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8924 (55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(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	269.0921	237.9668	252.6200	221.4724	214.2980	192.6605	189.7371	197.4584	199.8493	223.3942	238.2348	266.0536	(62)
WWHRS	-30.8664	-27.2985	-28.5854	-23.6698	-22.0594	-18.8764	-17.6936	-18.8154	-19.5303	-23.0240	-26.0834	-30.2948	(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	238.2258	210.6683	224.0346	197.8026	192.2386	173.7841	172.0435	178.6430	180.3191	200.3702	212.1513	235.7588	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2416.0398	(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	113.2811	100.6279	107.8041	96.6795	95.0620	87.0995	86.8955	89.4628	89.4898	98.0865	102.2530	112.2708	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.7455	130.3611	117.7455	121.6704	117.7455	121.6704	117.7455	117.7455	121.6704	117.7455	121.6704	117.7455	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	(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)	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	(71)
Water heating gains (Table 5)	152.2595	149.7439	144.8980	134.2771	127.7716	120.9716	116.7951	120.2458	124.2914	131.8367	142.0181	150.9016	(72)
Total internal gains	568.1899	580.7124	557.1463	537.4544	510.6191	489.3257	470.9239	471.9521	486.0272	505.6435	536.1546	556.5316	(73)

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6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
North			3.4300	10.6334	0.6300	0.7000	0.7700	11.1465 (74)				
East			7.9000	19.6403	0.6300	0.7000	0.7700	47.4183 (76)				
South			7.5400	46.7521	0.6300	0.7000	0.7700	107.7318 (78)				
West			0.5500	19.6403	0.6300	0.7000	0.7700	3.3013 (80)				
Solar gains	169.5979	296.9567	424.3442	550.4632	635.0749	637.5518	611.8050	548.3096	468.3362	333.3913	204.6909	144.0918 (83)
Total gains	737.7878	877.6691	981.4905	1087.9176	1145.6940	1126.8775	1082.7289	1020.2617	954.3634	839.0348	740.8455	700.6234 (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	44.6631	44.8325	44.9997	45.8025	45.9559	46.6836	46.6836	46.8209	46.4006	45.9559	45.6466	45.3278	
alpha	3.9775	3.9888	4.0000	4.0535	4.0637	4.1122	4.1122	4.1214	4.0934	4.0637	4.0431	4.0219	
util living area	0.9704	0.9436	0.8973	0.7981	0.6547	0.4817	0.3517	0.3875	0.5952	0.8387	0.9460	0.9751	(86)
MIT	19.6251	19.9173	20.2621	20.6425	20.8714	20.9721	20.9939	20.9910	20.9342	20.6248	20.0752	19.5866	(87)
Th 2	20.0424	20.0457	20.0489	20.0640	20.0668	20.0801	20.0801	20.0825	20.0750	20.0668	20.0611	20.0551	(88)
util rest of house	0.9644	0.9328	0.8783	0.7643	0.6040	0.4174	0.2796	0.3125	0.5276	0.8030	0.9338	0.9700	(89)
MIT 2	18.4591	18.8253	19.2497	19.7074	19.9560	20.0619	20.0774	20.0784	20.0276	19.7014	19.0386	18.4197	(90)
Living area fraction									fLA = Living area / (4) =			0.3333	(91)
MIT	18.8478	19.1893	19.5871	20.0191	20.2611	20.3653	20.3829	20.3826	20.3298	20.0092	19.3842	18.8087	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8478	19.1893	19.5871	20.0191	20.2611	20.3653	20.3829	20.3826	20.3298	20.0092	19.3842	18.8087	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9547	0.9210	0.8678	0.7625	0.6149	0.4377	0.3036	0.3373	0.5469	0.8005	0.9230	0.9611	(94)
Useful gains	704.3510	808.3573	851.7058	829.5746	704.5415	493.2405	328.6660	344.1379	521.9480	671.6473	683.8144	673.4000	(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	1328.1246	1299.5982	1185.8378	989.8538	759.5945	503.5544	330.4128	346.8305	547.4457	834.8388	1097.3060	1314.1261	(97)
Space heating kWh	464.0875	330.1139	248.5942	115.4010	40.9594	0.0000	0.0000	0.0000	0.0000	121.4144	297.7139	476.7002	(98a)
Space heating requirement - total per year (kWh/year)												2094.9846	
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	464.0875	330.1139	248.5942	115.4010	40.9594	0.0000	0.0000	0.0000	0.0000	121.4144	297.7139	476.7002	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2094.9846	
Space heating per m ²										(98c) / (4) =		24.0803	(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	464.0875	330.1139	248.5942	115.4010	40.9594	0.0000	0.0000	0.0000	0.0000	121.4144	297.7139	476.7002	(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)	502.8034	357.6532	269.3328	125.0282	44.3764	0.0000	0.0000	0.0000	0.0000	131.5432	322.5503	516.4683	(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	238.2258	210.6683	224.0346	197.8026	192.2386	173.7841	172.0435	178.6430	180.3191	200.3702	212.1513	235.7588	(64)
Efficiency of water heater	85.5281	85.0627	84.2936	82.8956	81.2463	79.8000	79.8000	79.8000	79.8000	82.9730	84.8196	85.6052	(216)
Fuel for water heating, kWh/month	278.5352	247.6623	265.7789	238.6165	236.6121	217.7745	215.5934	223.8634	225.9637	241.4884	250.1206	275.4025	(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	24.4652	19.6269	17.6718	12.9471	10.0007	8.1707	9.1230	11.8584	15.4029	20.2095	22.8266	25.1452	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-16.3457	-24.6685	-37.9243	-45.6973	-51.9963	-49.5274	-48.9147	-44.8091	-38.0827	-29.5029	-18.5342	-13.9483	(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)	-4.8852	-10.5816	-21.6184	-33.3571	-44.9992	-45.5540	-45.0292	-37.7217	-27.1178	-15.4279	-6.6140	-3.8415	(233b)

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Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													2269.7558	(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													2917.4116	(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)													197.4482	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-716.6988	(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													4753.9168	(238)

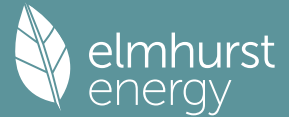
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2269.7558	0.2100	476.6487 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2917.4116	0.2100	612.6564 (264)
Space and water heating			1089.3052 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	197.4482	0.1443	28.4979 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-419.9513	0.1332	-55.9341
PV Unit electricity exported	-296.7476	0.1251	-37.1258
Total			-93.0599 (269)
Total CO2, kg/year			1036.6724 (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	2269.7558	1.1300	2564.8241 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2917.4116	1.1300	3296.6751 (278)
Space and water heating			5861.4992 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	197.4482	1.5338	302.8526 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-419.9513	1.4922	-626.6407
PV Unit electricity exported	-296.7476	0.4592	-136.2658
Total			-762.9065 (283)
Total Primary energy kWh/year			5531.5461 (286)
Target Primary Energy Rate (TPER)			63.5800 (287)

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Property Reference	13 Bedford Road_Copy				Issued on Date	27/02/2024
Assessment Reference	Flat 11 - Heatpump+PV Baseline		Prop Type Ref	13 Bedford Road		
Property	Flat 1, 13 Bedford Road, LONDON, N22 7AU					
SAP Rating	79 C	DER	5.43	TER	16.34	
Environmental	96 A	% DER < TER				66.77
CO ₂ Emissions (t/year)	0.32	DFEE	43.78	TFEE	44.47	
Compliance Check	See BREL	% DFEE < TFEE				1.55
% DPER < TPER	34.82	DPER	57.13	TPER	87.65	
Assessor Details	Mr. Mark Simons				Assessor ID	5542-0001
Client	EALConsult, Mark Simons					

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	64.0000 (1b)	2.6000 (2b)	166.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.0000		166.4000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	166.4000 (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) = 0.1202 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2702 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2702 (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	0.3445	0.3377	0.3310	0.2972	0.2905	0.2567	0.2567	0.2499	0.2702	0.2905	0.3040	0.3175 (22b)
Effective ac	0.5593	0.5570	0.5548	0.5442	0.5422	0.5329	0.5329	0.5312	0.5365	0.5422	0.5462	0.5504 (25)

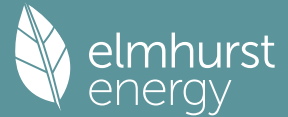
3. Heat losses and heat loss parameter

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
ENTRANCE DOOR			2.3400	1.0000	2.3400		(26)
WINDOWS (Uw = 1.00)			22.4300	0.9615	21.5673		(27)
EXTERNAL	91.8700	24.7700	67.1000	0.1600	10.7360	70.0000	4697.0000 (29a)
HALLWAY	9.7700		9.7700	0.1500	1.4655	70.0000	683.9000 (29a)
External Roof 1	64.0000		64.0000	0.1100	7.0400	9.0000	576.0000 (30)
Total net area of external elements Aum(A, m ²)			165.6400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		43.1488		(33)
Party Floor 1			64.0000			40.0000	2560.0000 (32d)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	12.4000	0.3000	3.7200
E2 Other lintels (including other steel lintels)	3.8000	0.0400	0.1520
E3 Sill	29.0400	0.0500	1.4520
E4 Jamb	36.3000	0.0700	2.5410
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.0900	1.2600
E16 Corner (normal)	2.8000	0.0600	0.1680
E18 Party wall between dwellings	36.3000	0.0400	1.4520
E14 Flat roof			

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E17 Corner (inverted - internal area greater than external area) 2.8000 -0.0900 -0.2520
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4930 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 53.6418 (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 30.7144 30.5879 30.4638 29.8813 29.7723 29.2650 29.2650 29.1710 29.4604 29.7723 29.9928 30.2233 (38)
 84.3562 84.2297 84.1057 83.5231 83.4141 82.9068 82.9068 82.8128 83.1022 83.4141 83.6346 83.8651 (39)
 Average = Sum(39)m / 12 = 83.5226

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 HLP (average) 1.3181 1.3161 1.3142 1.3050 1.3033 1.2954 1.2954 1.2940 1.2985 1.3033 1.3068 1.3104 (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 2.0922 (42)
 Hot water usage for mixer showers 59.2986 58.4075 57.1089 54.6243 52.7908 50.7460 49.5837 50.8725 52.2852 54.4806 57.0186 59.0714 (42a)
 Hot water usage for baths 26.9722 26.5716 26.0075 24.9674 24.1886 23.3250 22.8586 23.4187 24.0286 24.9527 26.0142 26.8810 (42b)
 Hot water usage for other uses 37.9537 36.5736 35.1934 33.8133 32.4332 31.0530 31.0530 32.4332 33.8133 35.1934 36.5736 37.9537 (42c)
 Average daily hot water use (litres/day) 114.1822 (43)
 Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 Energy conte 124.2245 121.5526 118.3098 113.4050 109.4125 105.1241 103.4954 106.7244 110.1271 114.6268 119.6064 123.9061 (44)
 Energy content (annual) 196.7412 173.0893 181.8378 155.2458 147.2903 129.2623 125.1687 132.1471 135.7978 155.5475 170.4012 194.0070 (45)
 Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1896.5361
 29.5112 25.9634 27.2757 23.2869 22.0935 19.3893 18.7753 19.8221 20.3697 23.3321 25.5602 29.1011 (46)
 Water storage loss:
 Store volume 200.0000 (47)
 a) If manufacturer declared loss factor is known (kWh/day): 2.1000 (48)
 Temperature factor from Table 2b 0.5400 (49)
 Enter (49) or (54) in (55) 1.1340 (55)
 Total storage loss
 35.1540 31.7520 35.1540 34.0200 35.1540 34.0200 35.1540 35.1540 34.0200 35.1540 34.0200 35.1540 (56)
 If cylinder contains dedicated solar storage
 35.1540 31.7520 35.1540 34.0200 35.1540 34.0200 35.1540 35.1540 34.0200 35.1540 34.0200 35.1540 (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
 255.1576 225.8525 240.2542 211.7778 205.7067 185.7943 183.5851 190.5635 192.3298 213.9639 226.9332 252.4234 (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
 255.1576 225.8525 240.2542 211.7778 205.7067 185.7943 183.5851 190.5635 192.3298 213.9639 226.9332 252.4234 (64)
 Total per year (kWh/year) = Sum(64)m = 2584.3421 (64)
 2584 (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
 112.1496 99.7628 107.1942 96.8448 95.7072 88.2053 88.3517 90.6720 90.3784 98.4526 101.8840 111.2405 (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 92.2575 102.1422 92.2575 95.3327 92.2575 95.3327 92.2575 92.2575 95.3327 92.2575 95.3327 92.2575 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 182.9108 184.8088 180.0258 169.8433 156.9898 144.9093 136.8388 134.9408 139.7238 149.9062 162.7598 174.8402 (68)
 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 33.4609 33.4609 33.4609 33.4609 33.4609 33.4609 33.4609 33.4609 33.4609 33.4609 33.4609 33.4609 (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) -83.6873 -83.6873 -83.6873 -83.6873 -83.6873 -83.6873 -83.6873 -83.6873 -83.6873 -83.6873 -83.6873 -83.6873 (71)
 Water heating gains (Table 5) 150.7387 148.4565 144.0782 134.5067 128.6386 122.5074 118.7523 121.8710 125.5255 132.3288 141.5056 149.5167 (72)
 Total internal gains 480.2896 489.7902 470.7442 454.0655 432.2687 417.1322 402.2313 403.4520 414.9647 428.8753 453.9807 470.9972 (73)

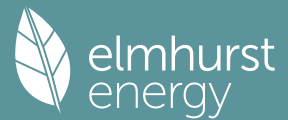
6. Solar gains

[Jan] Area m2 Solar flux Table 6a W/m2 g Specific data or Table 6b FF Specific data or Table 6c Access factor Table 6d Gains W
 North 0.3600 10.6334 0.5700 0.7000 1.0585 (74)
 East 16.9500 19.6403 0.5700 0.7000 92.0499 (76)
 West 5.1200 19.6403 0.5700 0.7000 27.8050 (80)
 Solar gains 120.9134 236.4844 389.5621 568.6612 697.5867 714.4526 680.0414 583.6578 453.2119 280.6163 150.7507 99.4452 (83)
 Total gains 601.2030 726.2746 860.3063 1022.7267 1129.8554 1131.5848 1082.2727 987.1098 868.1766 709.4916 604.7315 570.4424 (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	28.0454	28.0876	28.1290	28.3252	28.3622	28.5357	28.5357	28.5681	28.4686	28.3622	28.2874	28.2096
alpha	2.8697	2.8725	2.8753	2.8883	2.8908	2.9024	2.9024	2.9045	2.8979	2.8908	2.8858	2.8806
util living area	0.9483	0.9152	0.8543	0.7384	0.5922	0.4397	0.3274	0.3706	0.5764	0.8123	0.9210	0.9546 (86)
Living	20.1479	20.2413	20.3726	20.5189	20.6137	20.6618	20.6762	20.6734	20.6358	20.4964	20.2962	20.1317
Non living	18.8093	18.9265	19.0882	19.2663	19.3708	19.4235	19.4345	19.4343	19.4001	19.2482	19.0040	18.7944
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	20.5641	20.2413	20.3726	20.5189	20.6137	20.6618	20.6762	20.6734	20.6358	20.4964	20.2962	20.2531 (87)
Th 2	19.8267	19.8283	19.8298	19.8369	19.8382	19.8444	19.8444	19.8456	19.8420	19.8382	19.8355	19.8327 (88)
util rest of house	0.9391	0.9009	0.8307	0.6995	0.5370	0.3691	0.2452	0.2834	0.5012	0.7728	0.9051	0.9465 (89)
MIT 2	19.4211	18.9265	19.0882	19.2663	19.3708	19.4235	19.4345	19.4343	19.4001	19.2482	19.0040	18.9815 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.8855	19.4606	19.6100	19.7752	19.8757	19.9265	19.9389	19.9377	19.9021	19.7553	19.5289	0.4062 (91)
Temperature adjustment												19.4981 (92)
adjusted MIT	19.8855	19.4606	19.6100	19.7752	19.8757	19.9265	19.9389	19.9377	19.9021	19.7553	19.5289	0.0000 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9396	0.8958	0.8257	0.6973	0.5389	0.3743	0.2521	0.2906	0.5054	0.7697	0.9002	0.9438 (94)
Useful gains	564.8967	650.5634	710.3660	713.1241	608.9075	423.6050	272.8638	286.8678	438.7892	546.0648	544.4046	538.3870 (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	1314.7307	1226.4379	1102.6223	908.3300	681.9728	441.6064	276.8213	292.9692	482.1693	763.6775	1039.4883	1282.9792 (97)
Space heating kWh	557.8765	386.9877	291.8387	140.5483	54.3606	0.0000	0.0000	0.0000	0.0000	161.9038	356.4603	553.9766 (98a)
Space heating requirement - total per year (kWh/year)												2503.9525
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	557.8765	386.9877	291.8387	140.5483	54.3606	0.0000	0.0000	0.0000	0.0000	161.9038	356.4603	553.9766 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2503.9525
Space heating per m2										(98c) / (4) =		39.1243 (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 %)												307.9710 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	557.8765	386.9877	291.8387	140.5483	54.3606	0.0000	0.0000	0.0000	0.0000	161.9038	356.4603	553.9766 (98)
Space heating efficiency (main heating system 1)	307.9710	307.9710	307.9710	307.9710	307.9710	0.0000	0.0000	0.0000	0.0000	307.9710	307.9710	307.9710 (210)
Space heating fuel (main heating system)	181.1458	125.6572	94.7617	45.6368	17.6512	0.0000	0.0000	0.0000	0.0000	52.5711	115.7447	179.8795 (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	255.1576	225.8525	240.2542	211.7778	205.7067	185.7943	183.5851	190.5635	192.3298	213.9639	226.9332	252.4234 (64)
Efficiency of water heater	175.9360	175.9360	175.9360	175.9360	175.9360	175.9360	175.9360	175.9360	175.9360	175.9360	175.9360	175.9360 (216)
Fuel for water heating, kWh/month	145.0287	128.3720	136.5578	120.3721	116.9214	105.6034	104.3477	108.3141	109.3181	121.6146	128.9862	143.4746 (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	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	19.0690	15.2979	13.7740	10.0915	7.7949	6.3685	7.1108	9.2429	12.0056	15.7520	17.7918	19.5990 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-1.4715	-2.6896	-5.1245	-7.4393	-9.5144	-9.4340	-9.2221	-7.8098	-5.7039	-3.5536	-1.7854	-1.1942 (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												813.0481 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												175.9360
Water heating fuel used												1468.9107 (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)												153.8979 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-64.9423 (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	2370.9144 (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	813.0481	0.1561	126.9340 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1468.9107	0.1408	206.8452 (264)
Space and water heating			333.7792 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	153.8979	0.1443	22.2122 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-64.9423	0.1301	-8.4478
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-8.4478 (269)
Total CO2, kg/year			347.5436 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.4300 (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	813.0481	1.5780	1282.9495 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1468.9107	1.5207	2233.7432 (278)
Space and water heating			3516.6927 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	153.8979	1.5338	236.0538 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-64.9423	1.4805	-96.1466
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-96.1466 (283)
Total Primary energy kWh/year			3656.5999 (286)
Dwelling Primary energy Rate (DPER)			57.1300 (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	64.0000 (1b)	x 2.6000 (2b)	= 166.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 166.4000 (5)

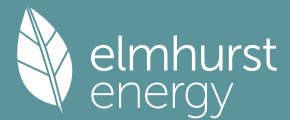
2. Ventilation rate

	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) =	0.1202 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3702	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3702	(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	0.4720	0.4627	0.4535	0.4072	0.3980	0.3517	0.3517	0.3424	0.3702	0.3980	0.4165	0.4350 (22b)
Effective ac	0.6114	0.6071	0.6028	0.5829	0.5792	0.5618	0.5618	0.5586	0.5685	0.5792	0.5867	0.5946 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3400	1.0000	2.3400			(26)
TER Opening Type (Uw = 1.20)			13.6600	1.1450	15.6412			(27)
EXTERNAL	91.8700	16.0000	75.8700	0.1800	13.6566			(29a)
HALLWAY	9.7700		9.7700	0.1800	1.7586			(29a)
External Roof 1	64.0000		64.0000	0.1100	7.0400			(30)
Total net area of external elements Aum(A, m2)			165.6400					(31)
Fabric heat loss, W/K = Sum (A x U)					40.4364			(33)

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

133.0766 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	12.4000	0.0500	0.6200	
E2 Other lintels (including other steel lintels)	3.8000	0.0500	0.1900	
E3 Sill	29.0400	0.0500	1.4520	
E4 Jamb	36.3000	0.0700	2.5410	
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.0900	1.2600	
E16 Corner (normal)	2.8000	0.0600	0.1680	
E18 Party wall between dwellings	36.3000	0.0800	2.9040	
E14 Flat roof	2.8000	-0.0900	-0.2520	
E17 Corner (inverted - internal area greater than external area)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				8.8830 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 49.3194 (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	33.5726	33.3351	33.1023	32.0088	31.8042	30.8518	30.8518	30.6754	31.2186	31.8042	32.2181	32.6508	(38)
Heat transfer coeff	82.8921	82.6545	82.4217	81.3282	81.1236	80.1712	80.1712	79.9948	80.5381	81.1236	81.5375	81.9702	(39)
Average = Sum(39)m / 12 =													81.3272

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2952	1.2915	1.2878	1.2708	1.2676	1.2527	1.2527	1.2499	1.2584	1.2676	1.2740	1.2808	(40)
HLP (average)													1.2707
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

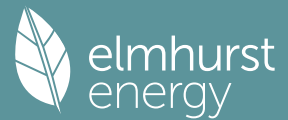
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0922 (42)
Hot water usage for mixer showers	59.2986	58.4075	57.1089	54.6243	52.7908	50.7460	49.5837	50.8725	52.2852	54.4806	57.0186	59.0714	(42a)
Hot water usage for baths	25.6236	25.2430	24.7071	23.7191	22.9792	22.1588	21.7157	22.2478	22.8272	23.7051	24.7135	25.5369	(42b)
Hot water usage for other uses	36.0560	34.7449	33.4338	32.1226	30.8115	29.5004	29.5004	30.8115	32.1226	33.4338	34.7449	36.0560	(42c)
Average daily hot water use (litres/day)													111.2066 (43)
Daily hot water use	120.9782	118.3954	115.2498	110.4660	106.5815	102.4052	100.7998	103.9318	107.2350	111.6195	116.4770	120.6644	(44)
Energy conte	191.5999	168.5935	177.1346	151.2224	143.4791	125.9191	121.9086	128.6893	132.2315	151.4666	165.9428	188.9313	(45)
Energy content (annual)										Total = Sum(45)m =		1847.1187	
Distribution loss (46)m = 0.15 x (45)m	28.7400	25.2890	26.5702	22.6834	21.5219	18.8879	18.2863	19.3034	19.8347	22.7200	24.8914	28.3397	(46)
Water storage loss:													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6525 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8924 (55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(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	242.5260	214.5912	228.0607	200.5057	194.4052	175.2024	172.8347	179.6154	181.5148	202.3926	215.2261	239.8573	(62)
WWHRS	-27.1088	-23.9753	-25.1055	-20.7884	-19.3740	-16.5785	-15.5397	-16.5249	-17.1527	-20.2212	-22.9082	-26.6068	(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	215.4171	190.6159	202.9552	179.7174	175.0312	158.6239	157.2950	163.0905	164.3621	182.1714	192.3179	213.2505	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2194.8481	(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	104.4478	92.8555	99.6381	89.7081	88.4477	81.2947	81.2755	83.5300	83.3936	91.1035	94.6026	103.5605	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	92.4146	102.3162	92.4146	95.4951	92.4146	95.4951	92.4146	92.4146	95.4951	92.4146	95.4951	92.4146	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	182.9108	184.8088	180.0258	169.8433	156.9898	144.9093	136.8388	134.9408	139.7238	149.9062	162.7598	174.8402	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	(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)	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	(71)
Water heating gains (Table 5)	140.3869	138.1779	133.9222	124.5946	118.8813	112.9094	109.2412	112.2716	115.8245	122.4509	131.3925	139.1942	(72)
Total internal gains	473.0950	482.6856	463.7454	447.3158	425.6685	407.6966	392.8774	394.0097	405.4261	422.1545	447.0301	463.8318	(73)

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6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	0.2200		10.6334		0.6300		0.7000		0.7700		0.7149	(74)
East	10.3200		19.6403		0.6300		0.7000		0.7700		61.9439	(76)
West	3.1200		19.6403		0.6300		0.7000		0.7700		18.7272	(80)
Solar gains	81.3861	159.1762	262.2121	382.7639	469.5449	480.8981	457.7356	392.8586	305.0548	188.8812	101.4694	66.9361 (83)
Total gains	554.4811	641.8618	725.9575	830.0797	895.2133	888.5947	850.6130	786.8684	710.4809	611.0357	548.4996	530.7679 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.5408	28.6228	28.7037	29.0896	29.1630	29.5094	29.5094	29.5745	29.3750	29.1630	29.0149	28.8618	
alpha	2.9027	2.9082	2.9136	2.9393	2.9442	2.9673	2.9673	2.9716	2.9583	2.9442	2.9343	2.9241	
util living area	0.9567	0.9341	0.8929	0.8057	0.6796	0.5235	0.3963	0.4403	0.6497	0.8518	0.9349	0.9613 (86)	
MIT	18.8223	19.1332	19.6023	20.1905	20.6245	20.8763	20.9597	20.9444	20.7575	20.1694	19.4079	18.7801 (87)	
Th 2	19.8446	19.8475	19.8504	19.8638	19.8663	19.8781	19.8781	19.8803	19.8736	19.8663	19.8612	19.8559 (88)	
util rest of house	0.9488	0.9225	0.8740	0.7722	0.6259	0.4471	0.3024	0.3432	0.5751	0.8179	0.9214	0.9542 (89)	
MIT 2	17.3494	17.7397	18.3225	19.0378	19.5295	19.7924	19.8595	19.8526	19.6872	19.0354	18.0996	17.3032 (90)	
Living area fraction									fLA = Living area / (4) =				0.4062 (91)
MIT	17.9477	18.3058	18.8424	19.5061	19.9744	20.2327	20.3064	20.2962	20.1220	19.4961	18.6311	17.9032 (92)	
Temperature adjustment												0.0000	
adjusted MIT	17.9477	18.3058	18.8424	19.5061	19.9744	20.2327	20.3064	20.2962	20.1220	19.4961	18.6311	17.9032 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9314	0.9025	0.8538	0.7603	0.6314	0.4722	0.3391	0.3804	0.5928	0.8048	0.9026	0.9378 (94)
Useful gains	516.4498	579.2606	619.8301	631.1020	565.2589	419.5989	288.4843	299.3536	421.1688	491.7909	495.0859	497.7587 (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	1131.2890	1108.0483	1017.2820	862.5732	671.2456	451.5815	297.1488	311.6729	484.9999	721.6798	940.2156	1123.2556 (97)
Space heating kWh	457.4403	355.3454	295.7042	166.6593	78.8541	0.0000	0.0000	0.0000	0.0000	171.0373	320.4934	465.3697 (98a)
Space heating requirement - total per year (kWh/year)												2310.9036
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	457.4403	355.3454	295.7042	166.6593	78.8541	0.0000	0.0000	0.0000	0.0000	171.0373	320.4934	465.3697 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2310.9036
Space heating per m2										(98c) / (4) =		36.1079 (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	457.4403	355.3454	295.7042	166.6593	78.8541	0.0000	0.0000	0.0000	0.0000	171.0373	320.4934	465.3697 (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)	495.6016	384.9896	320.3729	180.5626	85.4324	0.0000	0.0000	0.0000	0.0000	185.3058	347.2301	504.1925 (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	215.4171	190.6159	202.9552	179.7174	175.0312	158.6239	157.2950	163.0905	164.3621	182.1714	192.3179	213.2505 (64)
Efficiency of water heater (217)m	85.7054	85.4358	84.9028	83.8910	82.3936	79.8000	79.8000	79.8000	79.8000	83.9186	85.1965	79.8000 (216)
Fuel for water heating, kWh/month	251.3460	223.1100	239.0443	214.2273	212.4329	198.7768	197.1115	204.3740	205.9675	217.0812	225.7345	248.6579 (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	19.2019	15.4045	13.8701	10.1618	7.8493	6.4129	7.1604	9.3073	12.0893	15.8618	17.9158	19.7356 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-12.1522	-18.4106	-28.4154	-34.3859	-39.2668	-37.4668	-37.0165	-33.8482	-28.6683	-22.0910	-13.8073	-10.3630 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-3.4659	-7.5205	-15.3861	-23.7691	-32.0862	-32.4781	-32.0916	-26.8641	-19.2952	-10.9615	-4.6925	-2.7237 (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)												

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(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												2503.6876	(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												2637.8641	(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)												154.9706	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-527.2267	(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												4855.2956	(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	2503.6876	0.2100	525.7744	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2637.8641	0.2100	553.9515	(264)
Space and water heating			1079.7259	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	154.9706	0.1443	22.3671	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-315.8921	0.1331	-42.0463	
PV Unit electricity exported	-211.3346	0.1251	-26.4348	
Total			-68.4811	(269)
Total CO2, kg/year			1045.5410	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.3400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2503.6876	1.1300	2829.1670	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2637.8641	1.1300	2980.7864	(278)
Space and water heating			5809.9534	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	154.9706	1.5338	237.6991	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-315.8921	1.4918	-471.2612	
PV Unit electricity exported	-211.3346	0.4591	-97.0257	
Total			-568.2869	(283)
Total Primary energy kWh/year			5609.4664	(286)
Target Primary Energy Rate (TPER)			87.6500	(287)

Project name

Shop 1, 13 Bedford Road Baseline**As designed**

Date: Mon Jul 17 15:34:23 2023

Administrative information

Building Details

Address: 13 Bedford Road, Wood Green, LONDON, N22 7AU

Certifier details

Name: Mark Simons

Telephone number: 020 8930 5668

Address: 17 Dobree Avenue, London, NW10 2AD

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.c.0

Interface to calculation engine: Lifespan SBEM

Interface to calculation engine version: v6.1.c.0

BRUKL compliance module version: v6.1.c.0

Foundation area [m²]: 139.02The CO₂ emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	4.85
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	5.12
Target primary energy rate (TPER), kWh/m ² annum	52.43
Building primary energy rate (BPER), kWh/m ² annum	56
Do the building's emission and primary energy rates exceed the targets?	BER > TER BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _a -Limit	U _a -Calc	U _i -Calc	First surface with maximum value
Walls*	0.26	0.28	0.28	GF/01 SHOP/East/Wall-External
Floors	0.18	0.15	0.18	GF/02 TOILETS/Floor-External
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.18	0.18	GF/01 SHOP/Roof
Windows** and roof windows	1.6	1.6	1.6	GF/01 SHOP/East/Wall-External/Glazing
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

U_a-Limit = Limiting area-weighted average U-values [W/(m²K)]U_i-Calc = Calculated maximum individual element U-values [W/(m²K)]U_a-Calc = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	8

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Air Con

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	6.5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- Instantaneous

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
GF/02 TOILETS	0.3	-	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
GF/01 SHOP	247	50	3
GF/02 TOILETS	601	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF/01 SHOP	YES (+13.4%)	NO
GF/02 TOILETS	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	139	139
External area [m ²]	343.6	343.6
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	8	3
Average conductance [W/K]	112.97	123.88
Average U-value [W/m ² K]	0.33	0.36
Alpha value* [%]	20.89	20.88

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

100	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	8.58	10.5
Cooling	10.73	8.44
Auxiliary	0.32	0.43
Lighting	15.78	14.36
Hot water	1.65	1.65
Equipment*	20.24	20.24
TOTAL**	37.06	35.39

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	278.9	233.52
Primary energy [kWh/m ²]	56	52.43
Total emissions [kg/m ²]	5.12	4.85

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	100.7	178.2	8.6	10.7	0.3	3.26	4.62	3.5	6.5
	Notional	99.8	133.7	10.5	8.4	0.4	2.64	4.4	----	----

Key to terms	
Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Project name

Shop 2, 13 Bedford Road Baseline**As designed**

Date: Mon Jul 17 15:42:44 2023

Administrative information

Building Details

Address: 13 Bedford Road, Wood Green, LONDON, N22 7AU

Certifier details

Name: Mark Simons

Telephone number: 020 8930 5668

Address: 17 Dobree Avenue, London, NW10 2AD

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.c.0

Interface to calculation engine: Lifespan SBEM

Interface to calculation engine version: v6.1.c.0

BRUKL compliance module version: v6.1.c.0

Foundation area [m²]: 119.35The CO₂ emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	5.3
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	5.36
Target primary energy rate (TPER), kWh/m ² annum	56.91
Building primary energy rate (BPER), kWh/m ² annum	58.31
Do the building's emission and primary energy rates exceed the targets?	BER > TER BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.28	0.28	GF/01 SHOP/East/Wall-External
Floors	0.18	0.14	0.18	GF/02 TOILETS/Floor-External
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.18	0.18	GF/01 SHOP/Roof
Windows** and roof windows	1.6	1.6	1.6	GF/01 SHOP/East/Wall-External/Glazing
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	8

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Air Con

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	6.5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- Instantaneous

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
GF/02 TOILETS	0.3	-	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
GF/01 SHOP	233	50	3
GF/02 TOILETS	599	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF/01 SHOP	YES (+34%)	NO
GF/02 TOILETS	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	119.4	119.4
External area [m ²]	353.3	353.3
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	8	3
Average conductance [W/K]	105.42	103.91
Average U-value [W/m ² K]	0.3	0.29
Alpha value* [%]	16.4	17.92

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

100	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	10.32	12.78
Cooling	10.04	6.79
Auxiliary	0.38	0.5
Lighting	16.12	16.56
Hot water	1.65	1.65
Equipment*	20.23	20.23
TOTAL **	38.51	38.28

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>0</i>

Energy & CO₂ Emissions Summary

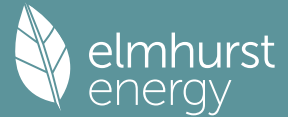
	Actual	Notional
Heating + cooling demand [MJ/m ²]	288.02	229.07
Primary energy [kWh/m ²]	58.31	56.91
Total emissions [kg/m ²]	5.36	5.3

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	121.1	166.9	10.3	10	0.4	3.26	4.62	3.5	6.5
	Notional	121.5	107.6	12.8	6.8	0.5	2.64	4.4	----	----

Key to terms	
Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

1b. Be Lean SAP/SBEM Calculations

Full SAP Calculation Printout



Property Reference	13 Bedford Road_Copy				Issued on Date	27/02/2024
Assessment Reference	Flat 4 - Heatpump_Copy		Prop Type Ref	13 Bedford Road		
Property	Flat 1, 13 Bedford Road, LONDON, N22 7AU					
SAP Rating	88 B	DER	2.87	TER	11.92	
Environmental	98 A	% DER < TER				75.92
CO ₂ Emissions (t/year)	0.22	DFEE	26.38	TFEE	31.13	
Compliance Check	See BREL	% DFEE < TFEE				15.28
% DPER < TPER	52.51	DPER	30.20	TPER	63.58	
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	87.0000 (1b)	2.6000 (2b)	226.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		226.2000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	226.2000 (5)

2. Ventilation rate

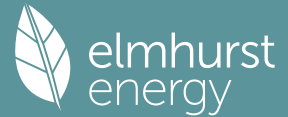
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.0884 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2384 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2384 (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	0.3040	0.2980	0.2921	0.2623	0.2563	0.2265	0.2265	0.2205	0.2384	0.2563	0.2682	0.2801 (22b)
Effective ac	0.5462	0.5444	0.5426	0.5344	0.5328	0.5257	0.5257	0.5243	0.5284	0.5328	0.5360	0.5392 (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
ENTRANCE DOOR			2.3400	0.8000	1.8720		(26)
WINDOWS (Uw = 0.80)			25.5000	0.7752	19.7674		(27)
EXTERNAL	86.2100	27.8400	58.3700	0.1500	8.7555	70.0000	4085.9000 (29a)
External Roof 1	6.3100		6.3100	0.1100	0.6941	9.0000	56.7900 (30)
Total net area of external elements Aum(A, m ²)			92.5200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.0890		(33)
Party Wall 1			21.2700	0.0000	0.0000	180.0000	3828.6000 (32)
Party Floor 1			87.0000			40.0000	3480.0000 (32d)
Party Ceiling 1			80.6900			30.0000	2420.7000 (32b)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13871.9900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							159.4482 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				12.2600	0.3000	3.6780	
E3 Sill				4.8000	0.0400	0.1920	
E4 Jamb				27.9200	0.0500	1.3960	
E7 Party floor between dwellings (in blocks of flats)				58.6100	0.0700	4.1027	
E16 Corner (normal)				10.4000	0.0900	0.9360	
E18 Party wall between dwellings				5.2000	0.0600	0.3120	

Full SAP Calculation Printout



P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3600	0.0000	0.0000	
E14 Flat roof	7.7100	0.0400	0.3084	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				10.9251 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =		42.0141 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)				
(38)m	Jan	Feb	Mar	Apr
Heat transfer coeff	40.7718	40.6379	40.5066	39.8901
Average = Sum(39)m / 12 =	82.7860	82.6521	82.5208	81.9042
	81.7889	81.2518	81.2518	81.1524
	81.4587	81.7889	82.0222	82.2662 (39)
	81.9037			
HLP	Jan	Feb	Mar	Apr
HLP (average)	0.9516	0.9500	0.9485	0.9414
Days in mont	31	28	31	30
	31	30	31	30
	31	30	31	30
	31	30	31	30

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5824 (42)
Hot water usage for mixer showers	67.5179	66.5033	65.0247	62.1958	60.1080	57.7799	56.4565	57.9239	59.5324	62.0322	64.9219	67.2593 (42a)
Hot water usage for baths	30.6928	30.2370	29.5951	28.4115	27.5253	26.5426	26.0118	26.6492	27.3432	28.3947	29.6027	30.5890 (42b)
Hot water usage for other uses	43.2382	41.6659	40.0936	38.5213	36.9490	35.3767	35.3767	36.9490	38.5213	40.0936	41.6659	43.2382 (42c)
Average daily hot water use (litres/day)												130.0138 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	141.4489	138.4061	134.7133	129.1285	124.5823	119.6991	117.8450	121.5221	125.3969	130.5205	136.1904	141.0865 (44)
Energy content (annual)	224.0205	197.0885	207.0494	176.7705	167.7117	147.1840	142.5233	150.4697	154.6269	177.1151	194.0282	220.9073 (45)
Distribution loss (46)m = 0.15 x (45)m	33.6031	29.5633	31.0574	26.5156	25.1568	22.0776	21.3785	22.5705	23.1940	26.5673	29.1042	33.1361 (46)
Water storage loss:												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.1000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.1340 (55)
Total storage loss	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540 (56)
If cylinder contains dedicated solar storage	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540 (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	282.4369	249.8517	265.4658	233.3025	226.1281	203.7160	200.9397	208.8861	211.1589	235.5315	250.5602	279.3237 (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	282.4369	249.8517	265.4658	233.3025	226.1281	203.7160	200.9397	208.8861	211.1589	235.5315	250.5602	279.3237 (64)
12Total per year (kWh/year)												2847.3011 (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	121.2199	107.7425	115.5770	104.0018	102.4973	94.1643	94.1221	96.7643	96.6390	105.6239	109.7400	120.1848 (65)

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

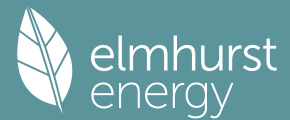
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	117.7482	130.3641	117.7482	121.6731	117.7482	121.6731	117.7482	117.7482	121.6731	117.7482	121.6731	117.7482 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120 (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)	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956 (71)
Water heating gains (Table 5)	162.9300	160.3311	155.3455	144.4469	137.7651	130.7837	126.5082	130.0595	134.2209	141.9676	152.4167	161.5387 (72)
Total internal gains	575.8631	588.3025	564.5965	544.6270	517.6153	499.1405	480.6397	481.7685	495.9594	512.7770	543.5559	564.1714 (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	
North	4.5000	10.6334	0.5700	0.7000	0.7700	13.2309 (74)
East	10.3800	19.6403	0.5700	0.7000	0.7700	56.3704 (76)
South	9.9000	46.7521	0.5700	0.7000	0.7700	127.9800 (78)
West	0.7200	19.6403	0.5700	0.7000	0.7700	3.9101 (80)
Solar gains	201.4914	352.8046	504.1560	653.9998	754.5250	757.4660
Total gains	777.3545	941.1071	1068.7525	1198.6268	1272.1403	1256.6066
	1207.5172	1133.2097	1052.3836	908.8705	786.7406	171.1882 (83)
						735.3595 (84)

7. Mean internal temperature (heating season)

Full SAP Calculation Printout



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	46.5457	46.6211	46.6953	47.0468	47.1132	47.4245	47.4245	47.4827	47.3041	47.1132	46.9791	46.8398
alpha	4.1030	4.1081	4.1130	4.1365	4.1409	4.1616	4.1616	4.1655	4.1536	4.1409	4.1319	4.1227
util living area	0.9565	0.9150	0.8470	0.7222	0.5672	0.4076	0.2948	0.3272	0.5149	0.7779	0.9214	0.9639 (86)
Living	20.4836	20.5608	20.6422	20.7188	20.7583	20.7737	20.7766	20.7764	20.7677	20.7107	20.5865	20.4686
Non living	19.5001	19.5963	19.6952	19.7886	19.8311	19.8506	19.8527	19.8537	19.8438	19.7833	19.6353	19.4861
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	20.7358	20.5608	20.6422	20.7188	20.7583	20.7737	20.7766	20.7764	20.7677	20.7107	20.5865	20.5429 (87)
Th 2	20.1239	20.1252	20.1265	20.1324	20.1335	20.1388	20.1388	20.1397	20.1367	20.1335	20.1313	20.1289 (88)
util rest of house	0.9486	0.9012	0.8243	0.6872	0.5216	0.3549	0.2377	0.2670	0.4565	0.7394	0.9061	0.9572 (89)
MIT 2	19.8752	19.5963	19.6952	19.7886	19.8311	19.8506	19.8527	19.8537	19.8438	19.7833	19.6353	19.6019 (90)
Living area fraction									fLA = Living area / (4) =			0.3333 (91)
MIT	20.1621	19.9178	20.0108	20.0987	20.1402	20.1583	20.1606	20.1612	20.1518	20.0924	19.9524	19.9156 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1621	19.9178	20.0108	20.0987	20.1402	20.1583	20.1606	20.1612	20.1518	20.0924	19.9524	19.9156 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9490	0.8975	0.8210	0.6857	0.5220	0.3561	0.2391	0.2685	0.4575	0.7374	0.9026	0.9554 (94)
Useful gains	737.7226	844.6723	877.4984	821.9181	664.0618	447.5112	288.7317	304.2876	481.5081	670.2079	710.0962	702.5690 (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	1313.1577	1241.2513	1114.9255	917.2174	690.3103	451.6232	289.3074	305.2335	492.9678	776.3765	1054.1803	1292.8627 (97)
Space heating kWh	428.1237	266.5011	176.6458	68.6155	19.5289	0.0000	0.0000	0.0000	0.0000	78.9894	247.7406	439.1785 (98a)
Space heating requirement - total per year (kWh/year)												1725.3235
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	428.1237	266.5011	176.6458	68.6155	19.5289	0.0000	0.0000	0.0000	0.0000	78.9894	247.7406	439.1785 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1725.3235
Space heating per m2										(98c) / (4) =		19.8313 (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 %)													337.0975 (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	428.1237	266.5011	176.6458	68.6155	19.5289	0.0000	0.0000	0.0000	0.0000	78.9894	247.7406	439.1785 (98)	
Space heating efficiency (main heating system 1)	337.0975	337.0975	337.0975	337.0975	337.0975	0.0000	0.0000	0.0000	0.0000	337.0975	337.0975	337.0975 (210)	
Space heating fuel (main heating system)	127.0029	79.0576	52.4020	20.3548	5.7933	0.0000	0.0000	0.0000	0.0000	23.4322	73.4923	130.2823 (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	282.4369	249.8517	265.4658	233.3025	226.1281	203.7160	200.9397	208.8861	211.1589	235.5315	250.5602	279.3237 (64)	
Efficiency of water heater												291.4090 (216)	
(217)m	291.4090	291.4090	291.4090	291.4090	291.4090	291.4090	291.4090	291.4090	291.4090	291.4090	291.4090	291.4090 (217)	
Fuel for water heating, kWh/month	96.9211	85.7392	91.0973	80.0601	77.5982	69.9072	68.9545	71.6814	72.4613	80.8250	85.9823	95.8528 (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	26.7358	21.4485	19.3120	14.1488	10.9289	8.9290	9.9697	12.9590	16.8325	22.0851	24.9451	27.4789 (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													511.8174 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													291.4090
Water heating fuel used													977.0806 (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)													215.7734 (232)

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

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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	1704.6713	(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	511.8174	0.1574	80.5638 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	977.0806	0.1409	137.6568 (264)
Space and water heating			218.2206 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	215.7734	0.1443	31.1428 (268)
Total CO2, kg/year			249.3634 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.8700 (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	511.8174	1.5827	810.0370 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	977.0806	1.5209	1486.0849 (278)
Space and water heating			2296.1219 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	215.7734	1.5338	330.9604 (282)
Total Primary energy kWh/year			2627.0824 (286)
Dwelling Primary energy Rate (DPER)			30.2000 (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	87.0000 (1b)	2.6000 (2b)	226.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	226.2000 (5)

2. Ventilation rate

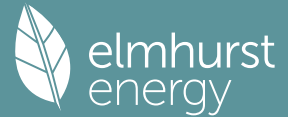
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1326 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3826 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3826 (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	0.4878	0.4783	0.4687	0.4209	0.4113	0.3635	0.3635	0.3539	0.3826	0.4113	0.4305	0.4496 (22b)
Effective ac	0.6190	0.6144	0.6098	0.5886	0.5846	0.5661	0.5661	0.5626	0.5732	0.5846	0.5926	0.6011 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			2.3400	1.0000	2.3400		(26)
TER Opening Type (Uw = 1.20)			19.4200	1.1450	22.2366		(27)
EXTERNAL	86.2100	21.7600	64.4500	0.1800	11.6010		(29a)

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External Roof 1	6.3100	6.3100	0.1100	0.6941	(30)
Total net area of external elements Aum(A, m2)		92.5200			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		36.8717	(33)
Party Wall 1		21.2700	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 168.7229 (35)

List of Thermal Bridges					
K1 Element		Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)		12.2600	0.0500	0.6130	
E3 Sill		4.8000	0.0500	0.2400	
E4 Jamb		27.9200	0.0500	1.3960	
E7 Party floor between dwellings (in blocks of flats)		58.6100	0.0700	4.1027	
E16 Corner (normal)		10.4000	0.0900	0.9360	
E18 Party wall between dwellings		5.2000	0.0600	0.3120	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)		16.3600	0.0000	0.0000	
E14 Flat roof		7.7100	0.0800	0.6168	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.2165 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 45.0882 (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	46.2057	45.8608	45.5227	43.9347	43.6376	42.2544	42.2544	41.9983	42.7872	43.6376	44.2386	44.8670	(38)
Average = Sum(39)m / 12 =	91.2940	90.9490	90.6109	89.0229	88.7258	87.3427	87.3427	87.0865	87.8754	88.7258	89.3269	89.9552	(39)
												89.0215	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0494	1.0454	1.0415	1.0233	1.0198	1.0039	1.0039	1.0010	1.0101	1.0198	1.0267	1.0340	(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													2.5824	(42)
Hot water usage for mixer showers														
Hot water usage for baths	67.5179	66.5033	65.0247	62.1958	60.1080	57.7799	56.4565	57.9239	59.5324	62.0322	64.9219	67.2593	(42a)	
Hot water usage for other uses	29.1581	28.7251	28.1153	26.9909	26.1490	25.2154	24.7112	25.3167	25.9760	26.9750	28.1225	29.0596	(42b)	
Average daily hot water use (litres/day)	41.0763	39.5826	38.0889	36.5952	35.1015	33.6079	33.6079	35.1015	36.5952	38.0889	39.5826	41.0763	(42c)	
													126.6255	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy conte	137.7524	134.8110	131.2289	125.7819	121.3586	116.6032	114.7755	118.3421	122.1037	127.0961	132.6270	137.3951	(44)	
Energy content (annual)	218.1661	191.9690	201.6940	172.1891	163.3720	143.3772	138.8111	146.5323	150.5660	172.4682	188.9515	215.1275	(45)	
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m =	2103.2239
Water storage loss:	32.7249	28.7954	30.2541	25.8284	24.5058	21.5066	20.8217	21.9798	22.5849	25.8702	28.3427	32.2691	(46)	
Store volume													200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6525	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.8924	(55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)	
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(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	269.0921	237.9668	252.6200	221.4724	214.2980	192.6605	189.7371	197.4584	199.8493	223.3942	238.2348	266.0536	(62)	
WWHRS	-30.8664	-27.2985	-28.5854	-23.6698	-22.0594	-18.8764	-17.6936	-18.8154	-19.5303	-23.0240	-26.0834	-30.2948	(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	238.2258	210.6683	224.0346	197.8026	192.2386	173.7841	172.0435	178.6430	180.3191	200.3702	212.1513	235.7588	(64)	
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m =	2416.0398
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	113.2811	100.6279	107.8041	96.6795	95.0620	87.0995	86.8955	89.4628	89.4898	98.0865	102.2530	112.2708	(65)	

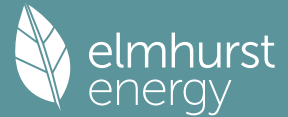
5. Internal gains (see Table 5 and 5a)

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	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	(66)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	117.7455	130.3611	117.7455	121.6704	117.7455	121.6704	117.7455	117.7455	121.6704	117.7455	121.6704	117.7455	(67)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486	(68)	
Pumps, fans	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	(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)	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	(71)	
Total internal gains	152.2595	149.7439	144.8980	134.2771	127.7716	120.9716	116.7951	120.2458	124.2914	131.8367	142.0181	150.9016	(72)	
	568.1899	580.7124	557.1463	537.4544	510.6191	489.3257	470.9239	471.9521	486.0272	505.6435	536.1546	556.5316	(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
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North	3.4300	10.6334	0.6300	0.7000	0.7700	11.1465 (74)
East	7.9000	19.6403	0.6300	0.7000	0.7700	47.4183 (76)
South	7.5400	46.7521	0.6300	0.7000	0.7700	107.7318 (78)
West	0.5500	19.6403	0.6300	0.7000	0.7700	3.3013 (80)

Solar gains	169.5979	296.9567	424.3442	550.4632	635.0749	637.5518	611.8050	548.3096	468.3362	333.3913	204.6909	144.0918 (83)
Total gains	737.7878	877.6691	981.4905	1087.9176	1145.6940	1126.8775	1082.7289	1020.2617	954.3634	839.0348	740.8455	700.6234 (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	44.6631	44.8325	44.9997	45.8025	45.9559	46.6836	46.6836	46.8209	46.4006	45.9559	45.6466	45.3278
alpha	3.9775	3.9888	4.0000	4.0535	4.0637	4.1122	4.1122	4.1214	4.0934	4.0637	4.0431	4.0219
util living area	0.9704	0.9436	0.8973	0.7981	0.6547	0.4817	0.3517	0.3875	0.5952	0.8387	0.9460	0.9751 (86)
MIT	19.6251	19.9173	20.2621	20.6425	20.8714	20.9721	20.9939	20.9910	20.9342	20.6248	20.0752	19.5866 (87)
Th 2	20.0424	20.0457	20.0489	20.0640	20.0668	20.0801	20.0801	20.0825	20.0750	20.0668	20.0611	20.0551 (88)
util rest of house	0.9644	0.9328	0.8783	0.7643	0.6040	0.4174	0.2796	0.3125	0.5276	0.8030	0.9338	0.9700 (89)
MIT 2	18.4591	18.8253	19.2497	19.7074	19.9560	20.0619	20.0774	20.0784	20.0276	19.7014	19.0386	18.4197 (90)
Living area fraction	18.8478	19.1893	19.5871	20.0191	20.2611	20.3653	20.3829	20.3826	FLA = Living area / (4) =			0.3333 (91)
MIT	18.8478	19.1893	19.5871	20.0191	20.2611	20.3653	20.3829	20.3826	20.3298	20.0092	19.3842	18.8087 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8478	19.1893	19.5871	20.0191	20.2611	20.3653	20.3829	20.3826	20.3298	20.0092	19.3842	18.8087 (93)

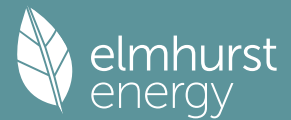
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9547	0.9210	0.8678	0.7625	0.6149	0.4377	0.3036	0.3373	0.5469	0.8005	0.9230	0.9611 (94)
Useful gains	704.3510	808.3573	851.7058	829.5746	704.5415	493.2405	328.6660	344.1379	521.9480	671.6473	683.8144	673.4000 (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	1328.1246	1299.5982	1185.8378	989.8538	759.5945	503.5544	330.4128	346.8305	547.4457	834.8388	1097.3060	1314.1261 (97)
Space heating kWh	464.0875	330.1139	248.5942	115.4010	40.9594	0.0000	0.0000	0.0000	0.0000	121.4144	297.7139	476.7002 (98a)
Space heating requirement - total per year (kWh/year)												2094.9846
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	464.0875	330.1139	248.5942	115.4010	40.9594	0.0000	0.0000	0.0000	0.0000	121.4144	297.7139	476.7002 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2094.9846
Space heating per m2										(98c) / (4) =		24.0803 (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	464.0875	330.1139	248.5942	115.4010	40.9594	0.0000	0.0000	0.0000	0.0000	121.4144	297.7139	476.7002 (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)	502.8034	357.6532	269.3328	125.0282	44.3764	0.0000	0.0000	0.0000	0.0000	131.5432	322.5503	516.4683 (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	238.2258	210.6683	224.0346	197.8026	192.2386	173.7841	172.0435	178.6430	180.3191	200.3702	212.1513	235.7588 (64)
Efficiency of water heater (217)m	85.5281	85.0627	84.2936	82.8956	81.2463	79.8000	79.8000	79.8000	79.8000	82.9730	84.8196	79.8000 (216)
Fuel for water heating, kWh/month	278.5352	247.6623	265.7789	238.6165	236.6121	217.7745	215.5934	223.8634	225.9637	241.4884	250.1206	275.4025 (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	24.4652	19.6269	17.6718	12.9471	10.0007	8.1707	9.1230	11.8584	15.4029	20.2095	22.8266	25.1452 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-16.3457	-24.6685	-37.9243	-45.6973	-51.9963	-49.5274	-48.9147	-44.8091	-38.0827	-29.5029	-18.5342	-13.9483 (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)	-4.8852	-10.5816	-21.6184	-33.3571	-44.9992	-45.5540	-45.0292	-37.7217	-27.1178	-15.4279	-6.6140	-3.8415 (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												2269.7558 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	79.8000	
Water heating fuel used	2917.4116	(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)	197.4482	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-716.6988	(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	4753.9168	(238)

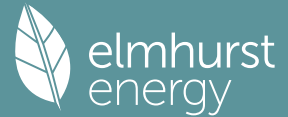
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2269.7558	0.2100	476.6487 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2917.4116	0.2100	612.6564 (264)
Space and water heating			1089.3052 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	197.4482	0.1443	28.4979 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-419.9513	0.1332	-55.9341
PV Unit electricity exported	-296.7476	0.1251	-37.1258
Total			-93.0599 (269)
Total CO2, kg/year			1036.6724 (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	2269.7558	1.1300	2564.8241 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2917.4116	1.1300	3296.6751 (278)
Space and water heating			5861.4992 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	197.4482	1.5338	302.8526 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-419.9513	1.4922	-626.6407
PV Unit electricity exported	-296.7476	0.4592	-136.2658
Total			-762.9065 (283)
Total Primary energy kWh/year			5531.5461 (286)
Target Primary Energy Rate (TPER)			63.5800 (287)

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Property Reference	13 Bedford Road_Copy			Issued on Date	27/02/2024
Assessment Reference	Flat 5 - Heatpump_Copy	Prop Type Ref	13 Bedford Road		
Property	Flat 1, 13 Bedford Road, LONDON, N22 7AU				
SAP Rating	88 B	DER	3.17	TER	13.24
Environmental	98 A	% DER < TER			76.06
CO ₂ Emissions (t/year)	0.17	DFEE	24.29	TFEE	29.08
Compliance Check	See BREL	% DFEE < TFEE			16.47
% DPER < TPER	52.85	DPER	33.50	TPER	71.05
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	61.0000 (1b)	2.6000 (2b)	158.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0000		158.6000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	158.6000 (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) = 0.1261 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2761 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2761 (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	0.3520	0.3451	0.3382	0.3037	0.2968	0.2623	0.2623	0.2554	0.2761	0.2968	0.3106	0.3244 (22b)
Effective ac	0.5620	0.5596	0.5572	0.5461	0.5440	0.5344	0.5344	0.5326	0.5381	0.5440	0.5482	0.5526 (25)

3. Heat losses and heat loss parameter

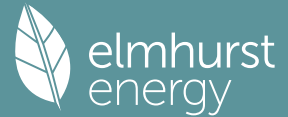
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
ENTRANCE DOOR			2.3400	0.8000	1.8720		(26)
WINDOWS (Uw = 0.80)			15.6000	0.7752	12.0930		(27)
EXTERNAL	56.1300	17.9400	38.1900	0.1500	5.7285	70.0000	2673.3000 (29a)
Total net area of external elements Aum(A, m ²)			56.1300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.6935		(33)
Party Wall 1			32.7900	0.0000	0.0000	180.0000	5902.2000 (32)
Party Floor 1			61.0000			40.0000	2440.0000 (32d)
Party Ceiling 1			61.0000			30.0000	1830.0000 (32b)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 12845.5000 (34)
210.5820 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.2000	0.3000	2.4600
E3 Sill	4.0300	0.0400	0.1612
E4 Jamb	26.6600	0.0500	1.3330
E7 Party floor between dwellings (in blocks of flats)	43.1800	0.0700	3.0226
E16 Corner (normal)	7.8000	0.0900	0.7020
E17 Corner (inverted - internal area greater than external area)	5.2000	-0.0900	-0.4680
E18 Party wall between dwellings	10.4000	0.0600	0.6240

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P3 Party wall - Intermediate floor between dwellings (in blocks of flats) 29.2200 0.0000 0.0000
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8348 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 27.5283 (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 29.4120 29.2861 29.1627 28.5829 28.4744 27.9694 27.9694 27.8759 28.1639 28.4744 28.6939 28.9233 (38)
 Average = Sum(39)m / 12 = 56.9404 56.8144 56.6910 56.1112 56.0027 55.4978 55.4978 55.4042 55.6923 56.0027 56.2222 56.4516 (39)
 56.1107

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 HLP (average) 0.9334 0.9314 0.9294 0.9199 0.9181 0.9098 0.9098 0.9083 0.9130 0.9181 0.9217 0.9254 (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 2.0098 (42)
 Hot water usage for mixer showers 57.9167 57.0463 55.7780 53.3513 51.5605 49.5634 48.4282 49.6869 51.0667 53.2110 55.6898 57.6948 (42a)
 Hot water usage for baths 26.3466 25.9553 25.4043 24.3884 23.6276 22.7841 22.3284 22.8756 23.4714 24.3740 25.4109 26.2576 (42b)
 Hot water usage for other uses 37.0652 35.7174 34.3696 33.0218 31.6739 30.3261 30.3261 31.6739 33.0218 34.3696 35.7174 37.0652 (42c)
 Average daily hot water use (litres/day) 111.5204 (43)
 Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 Energy conte 121.3286 118.7191 115.5519 110.7615 106.8621 102.6736 101.0828 104.2365 107.5598 111.9546 116.8181 121.0176 (44)
 Energy content (annual) 192.1548 169.0544 177.5990 151.6269 143.8569 126.2492 122.2509 129.0665 132.6320 151.9213 166.4288 189.4843 (45)
 Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1852.3250
 28.8232 25.3582 26.6399 22.7440 21.5785 18.9374 18.3376 19.3600 19.8948 22.7882 24.9643 28.4226 (46)
 Water storage loss:
 Store volume 200.0000 (47)
 a) If manufacturer declared loss factor is known (kWh/day): 2.1000 (48)
 Temperature factor from Table 2b 0.5400 (49)
 Enter (49) or (54) in (55) 1.1340 (55)
 Total storage loss
 35.1540 31.7520 35.1540 34.0200 35.1540 34.0200 35.1540 35.1540 34.0200 35.1540 34.0200 35.1540 (56)
 If cylinder contains dedicated solar storage
 35.1540 31.7520 35.1540 34.0200 35.1540 34.0200 35.1540 35.1540 34.0200 35.1540 34.0200 35.1540 (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
 250.5712 221.8176 236.0154 208.1589 202.2733 182.7812 180.6673 187.4829 189.1640 210.3377 222.9608 247.9007 (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
 250.5712 221.8176 236.0154 208.1589 202.2733 182.7812 180.6673 187.4829 189.1640 210.3377 222.9608 247.9007 (64)
 Total per year (kWh/year) = Sum(64)m = 2540.1310 (64)
 2540 (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
 110.6246 98.4211 105.7848 95.6415 94.5655 87.2034 87.3815 89.6477 89.3258 97.2470 100.5632 109.7367 (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 5 100.4881 100.4881 100.4881 100.4881 100.4881 100.4881 100.4881 100.4881 100.4881 100.4881 100.4881 100.4881 (66)
 88.4945 97.9760 88.4945 91.4443 88.4945 91.4443 88.4945 88.4945 91.4443 88.4945 91.4443 88.4945 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 175.4617 177.2825 172.6943 162.9265 150.5964 139.0079 131.2661 129.4454 134.0336 143.8013 156.1314 167.7199 (68)
 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 (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) -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 (71)
 Water heating gains (Table 5) 148.6890 146.4600 142.1839 132.8355 127.1042 121.1159 117.4483 120.4943 124.0635 130.7083 139.6711 147.4955 (72)
 Total internal gains 465.7916 474.8650 456.5190 440.3527 419.3416 404.7146 390.3553 391.5805 402.6878 416.1505 440.3932 456.8563 (73)

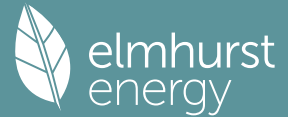
6. Solar gains

[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 2.5600 10.6334 0.5700 0.7700 7.5269 (74)
 East 8.5100 19.6403 0.5700 0.7700 46.2150 (76)
 South 4.5300 46.7521 0.5700 0.7700 58.5605 (78)
 Solar gains 112.3025 200.6978 295.4975 394.4799 462.8885 467.5045 447.5054 396.1058 330.1684 227.8422 136.3243 94.8815 (83)
 Total gains 578.0941 675.5628 752.0166 834.8326 882.2301 872.2191 837.8607 787.6863 732.8562 643.9928 576.7175 551.7378 (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	62.6655	62.8044	62.9411	63.5915	63.7147	64.2944	64.2944	64.4029	64.0698	63.7147	63.4660	63.2080
alpha	5.1777	5.1870	5.1961	5.2394	5.2476	5.2863	5.2863	5.2935	5.2713	5.2476	5.2311	5.2139
util living area	0.9688	0.9359	0.8735	0.7423	0.5745	0.4051	0.2911	0.3230	0.5159	0.7950	0.9371	0.9743 (86)
Living	20.6150	20.6722	20.7342	20.7913	20.8155	20.8231	20.8239	20.8241	20.8203	20.7856	20.6952	20.6054
Non living	19.6754	19.7472	19.8225	19.8938	19.9190	19.9329	19.9334	19.9350	19.9280	19.8910	19.7844	19.6699
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	20.8031	20.6722	20.7342	20.7913	20.8155	20.8231	20.8239	20.8241	20.8203	20.7856	20.6952	20.6606 (87)
Th 2	20.1392	20.1409	20.1426	20.1507	20.1522	20.1592	20.1592	20.1605	20.1565	20.1522	20.1491	20.1459 (88)
util rest of house	0.9616	0.9227	0.8501	0.7045	0.5269	0.3528	0.2357	0.2643	0.4561	0.7532	0.9218	0.9683 (89)
MIT 2	19.9543	19.7472	19.8225	19.8938	19.9190	19.9329	19.9334	19.9350	19.9280	19.8910	19.7844	19.7557 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.3021	20.1263	20.1961	20.2616	20.2864	20.2977	20.2984	20.2994	20.2937	20.2577	20.1577	20.1265 (91)
Temperature adjustment												0.0000
adjusted MIT	20.3021	20.1263	20.1961	20.2616	20.2864	20.2977	20.2984	20.2994	20.2937	20.2577	20.1577	20.1265 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9631	0.9225	0.8517	0.7097	0.5346	0.3615	0.2449	0.2741	0.4659	0.7588	0.9220	0.9682 (94)
Useful gains	556.7748	623.1751	640.4984	592.4527	471.5978	315.2659	205.1603	215.8745	341.4738	488.6497	531.7250	534.1818 (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	911.1677	865.0758	776.4480	637.5131	480.8622	316.2117	205.2517	216.0410	344.9425	540.8566	734.1328	899.0785 (97)
Space heating kWh	263.6684	162.5573	101.1465	32.4435	6.8927	0.0000	0.0000	0.0000	0.0000	38.8419	145.7336	271.4832 (98a)
Space heating requirement - total per year (kWh/year)												1022.7670
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	263.6684	162.5573	101.1465	32.4435	6.8927	0.0000	0.0000	0.0000	0.0000	38.8419	145.7336	271.4832 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1022.7670
Space heating per m2										(98c) / (4) =		16.7667 (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 %)												323.1386 (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	263.6684	162.5573	101.1465	32.4435	6.8927	0.0000	0.0000	0.0000	0.0000	38.8419	145.7336	271.4832 (98)
Space heating efficiency (main heating system 1)	323.1386	323.1386	323.1386	323.1386	323.1386	0.0000	0.0000	0.0000	0.0000	323.1386	323.1386	323.1386 (210)
Space heating fuel (main heating system)	81.5961	50.3057	31.3013	10.0401	2.1330	0.0000	0.0000	0.0000	0.0000	12.0202	45.0994	84.0145 (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	250.5712	221.8176	236.0154	208.1589	202.2733	182.7812	180.6673	187.4829	189.1640	210.3377	222.9608	247.9007 (64)
Efficiency of water heater	292.6535	292.6535	292.6535	292.6535	292.6535	292.6535	292.6535	292.6535	292.6535	292.6535	292.6535	292.6535 (216)
Fuel for water heating, kWh/month	85.6204	75.7953	80.6467	71.1281	69.1170	62.4565	61.7342	64.0631	64.6375	71.8726	76.1859	84.7079 (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	17.9560	14.4049	12.9701	9.5024	7.3399	5.9968	6.6957	8.7034	11.3048	14.8325	16.7533	18.4550 (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												316.5103 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												292.6535
Water heating fuel used												867.9653 (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)												144.9149 (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	1329.3905 (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	316.5103	0.1580	49.9946 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	867.9653	0.1408	122.2113 (264)
Space and water heating			172.2059 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	144.9149	0.1443	20.9157 (268)
Total CO ₂ , kg/year			193.1216 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.1700 (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	316.5103	1.5847	501.5700 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	867.9653	1.5206	1319.8544 (278)
Space and water heating			1821.4244 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	144.9149	1.5338	222.2753 (282)
Total Primary energy kWh/year			2043.6997 (286)
Dwelling Primary energy Rate (DPER)			33.5000 (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	61.0000 (1b)	x 2.6000 (2b)	= 158.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.6000 (5)

2. Ventilation rate

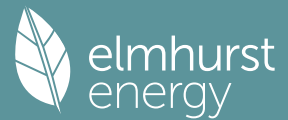
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1261 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3761 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3761 (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	0.4795	0.4701	0.4607	0.4137	0.4043	0.3573	0.3573	0.3479	0.3761	0.4043	0.4231	0.4419 (22b)
Effective ac	0.6150	0.6105	0.6061	0.5856	0.5817	0.5638	0.5638	0.5605	0.5707	0.5817	0.5895	0.5976 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.3400	1.0000	2.3400		(26)
TER Opening Type (Uw = 1.20)			12.9100	1.1450	14.7824		(27)
EXTERNAL	56.1300	15.2500	40.8800	0.1800	7.3584		(29a)
Total net area of external elements Aum(A, m ²)			56.1300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 24.4808		(33)

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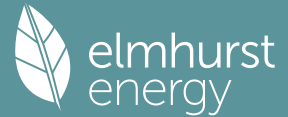
Party Wall 1	32.7900												0.0000	0.0000	(32)			
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K														220.5820 (35)				
List of Thermal Bridges																		
K1 Element													Length	Psi-value	Total			
E2 Other lintels (including other steel lintels)													8.2000	0.0500	0.4100			
E3 Sill													4.0300	0.0500	0.2015			
E4 Jamb													26.6600	0.0500	1.3330			
E7 Party floor between dwellings (in blocks of flats)													43.1800	0.0700	3.0226			
E16 Corner (normal)													7.8000	0.0900	0.7020			
E17 Corner (inverted - internal area greater than external area)													5.2000	-0.0900	-0.4680			
E18 Party wall between dwellings													10.4000	0.0600	0.6240			
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)													29.2200	0.0000	0.0000			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)														5.8251 (36)				
Point Thermal bridges														(36a) =	0.0000			
Total fabric heat loss														(33) + (36) + (36a) =	30.3059 (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						
	32.1866	31.9529	31.7239	30.6481	30.4468	29.5098	29.5098	29.3363	29.8707	30.4468	30.8540	31.2797	(38)					
Heat transfer coeff	62.4925	62.2589	62.0298	60.9540	60.7527	59.8157	59.8157	59.6422	60.1766	60.7527	61.1599	61.5856	(39)					
Average = Sum(39)m / 12 =														60.9530				
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
	1.0245	1.0206	1.0169	0.9992	0.9959	0.9806	0.9806	0.9777	0.9865	0.9959	1.0026	1.0096	(40)					
HLP (average)													0.9992					
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31						

4. Water heating energy requirements (kWh/year)														-----				
Assumed occupancy														2.0098 (42)				
Hot water usage for mixer showers														57.9167 57.0463 55.7780 53.3513 51.5605 49.5634 48.4282 49.6869 51.0667 53.2110 55.6898 57.6948 (42a)				
Hot water usage for baths														25.0293 24.6576 24.1341 23.1690 22.4462 21.6449 21.2120 21.7318 22.2978 23.1553 24.1403 24.9447 (42b)				
Hot water usage for other uses														35.2120 33.9315 32.6511 31.3707 30.0902 28.8098 28.8098 30.0902 31.3707 32.6511 33.9315 35.2120 (42c)				
Average daily hot water use (litres/day)														108.6142 (43)				
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
	118.1580	115.6354	112.5632	107.8910	104.0970	100.0181	98.4501	101.5090	104.7352	109.0174	113.7617	117.8515	(44)					
Energy conte	187.1333	164.6633	173.0055	147.6973	140.1346	122.9839	119.0668	125.6893	129.1490	147.9356	162.0744	184.5269	(45)					
Energy content (annual)													Total = Sum(45)m =	1804.0599				
Distribution loss (46)m = 0.15 x (45)m	28.0700	24.6995	25.9508	22.1546	21.0202	18.4476	17.8600	18.8534	19.3723	22.1903	24.3112	27.6790	(46)					
Water storage loss:														200.0000 (47)				
Store volume														1.6525 (48)				
a) If manufacturer declared loss factor is known (kWh/day):														0.5400 (49)				
Temperature factor from Table 2b														0.8924 (55)				
Enter (49) or (54) in (55)																		
Total storage loss														27.6637 24.9865 27.6637 26.7713 27.6637 26.7713 27.6637 27.6637 26.7713 27.6637 26.7713 27.6637 (56)				
If cylinder contains dedicated solar storage														27.6637 24.9865 27.6637 26.7713 27.6637 26.7713 27.6637 27.6637 26.7713 27.6637 26.7713 27.6637 (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														238.0594 210.6611 223.9316 196.9806 191.0606 172.2672 169.9929 176.6154 178.4322 198.8617 211.3577 235.4530 (62)				
WWHRS														-26.4771 -23.4166 -24.5205 -20.3039 -18.9225 -16.1921 -15.1775 -16.1398 -16.7530 -19.7500 -22.3743 -25.9868 (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														211.5823 187.2445 199.4111 176.6767 172.1381 156.0751 154.8153 160.4756 161.6792 179.1117 188.9834 209.4662 (64)				
12Total per year (kWh/year)														Total per year (kWh/year) = Sum(64)m = 2157.6593 (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														102.9627 91.5488 98.2652 88.5360 87.3356 80.3188 80.3306 82.5326 82.3687 89.9294 93.3164 102.0961 (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						
	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	(66)					
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														88.6967 98.1999 88.6967 91.6532 88.6967 91.6532 88.6967 88.6967 91.6532 88.6967 91.6532 88.6967 (67)				
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														175.4617 177.2825 172.6943 162.9265 150.5964 139.0079 131.2661 129.4454 134.0336 143.8013 156.1314 167.7199 (68)				
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 (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)														-80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 (71)				
Water heating gains (Table 5)														138.3907 136.2333 132.0769 122.9667 117.3866 111.5539 107.9712 110.9309 114.4009 120.8729 129.6061 137.2259 (72)				
Total internal gains														458.6956 467.8621 449.6143 433.6928 412.8261 395.3615 381.0804 382.2194 393.2342 409.5174 433.5371 449.7889 (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	
North													2.1200	10.6334	0.6300	0.7000	0.7700	6.8894 (74)
East													7.0400	19.6403	0.6300	0.7000	0.7700	42.2563 (76)

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South		3.7500			46.7521			0.6300			0.7000			0.7700			53.5801 (78)		
Solar gains		102.7258	183.5788	270.2838	360.8115	423.3769	427.5977	409.3061	362.2965	301.9929	208.4053	124.6983	86.7910 (83)						
Total gains		561.4214	651.4408	719.8981	794.5043	836.2030	822.9592	790.3865	744.5158	695.2271	617.9227	558.2355	536.5800 (84)						

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.8094	60.0339	60.2555	61.3190	61.5222	62.4859	62.4859	62.6677	62.1111	61.5222	61.1126	60.6901	
alpha	4.9873	5.0023	5.0170	5.0879	5.1015	5.1657	5.1657	5.1778	5.1407	5.1015	5.0742	5.0460	
util living area	0.9785	0.9561	0.9115	0.8032	0.6430	0.4604	0.3322	0.3672	0.5795	0.8453	0.9559	0.9821 (86)	
MIT	20.0175	20.2451	20.5158	20.8013	20.9454	20.9920	20.9988	20.9980	20.9753	20.7810	20.3681	19.9879 (87)	
Th 2	20.0630	20.0662	20.0693	20.0840	20.0867	20.0995	20.0995	20.1019	20.0946	20.0867	20.0811	20.0753 (88)	
util rest of house	0.9730	0.9457	0.8916	0.7658	0.5893	0.3976	0.2646	0.2962	0.5102	0.8057	0.9437	0.9775 (89)	
MIT 2	18.9438	19.2286	19.5589	19.8962	20.0438	20.0951	20.0991	20.1012	20.0790	19.8853	19.3967	18.9160 (90)	
Living area fraction	19.3839	19.6452	19.9510	20.2671	20.4133	20.4627	20.4678	20.4687	fLA = Living area / (4) =				0.4098 (91)
MIT	19.3839	19.6452	19.9510	20.2671	20.4133	20.4627	20.4678	20.4687	20.4463	20.2524	19.7948	19.3553 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.3839	19.6452	19.9510	20.2671	20.4133	20.4627	20.4678	20.4687	20.4463	20.2524	19.7948	19.3553 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9681	0.9402	0.8888	0.7737	0.6090	0.4231	0.2924	0.3253	0.5376	0.8135	0.9391	0.9730	(94)
Useful gains	543.4875	612.4549	639.8499	614.7442	509.2709	348.2133	231.0710	242.1751	373.7837	502.6594	524.2403	522.1061	(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	942.6290	918.0173	834.3648	692.8727	529.3591	350.6808	231.3580	242.6686	381.9014	586.4094	776.4140	933.3471	(97)
Space heating kWh	296.9613	205.3379	144.7191	56.2525	14.9456	0.0000	0.0000	0.0000	0.0000	62.3100	181.5651	305.9633	(98a)
Space heating requirement - total per year (kWh/year)												1268.0548	
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	296.9613	205.3379	144.7191	56.2525	14.9456	0.0000	0.0000	0.0000	0.0000	62.3100	181.5651	305.9633	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1268.0548	
Space heating per m2										(98c) / (4) =		20.7878	(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	296.9613	205.3379	144.7191	56.2525	14.9456	0.0000	0.0000	0.0000	0.0000	62.3100	181.5651	305.9633 (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)	321.7349	222.4680	156.7921	60.9453	16.1924	0.0000	0.0000	0.0000	0.0000	67.5081	196.7119	331.4879 (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	211.5823	187.2445	199.4111	176.6767	172.1381	156.0751	154.8153	160.4756	161.6792	179.1117	188.9834	209.4662 (64)
Efficiency of water heater (217)m	84.8199	84.2671	83.3526	81.8022	80.4514	79.8000	79.8000	79.8000	79.8000	81.9435	83.9701	79.8000 (216)
Fuel for water heating, kWh/month	249.4488	222.2036	239.2379	215.9803	213.9654	195.5828	194.0042	201.0973	202.6056	218.5795	225.0604	84.9083 (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	18.4294	14.7848	13.3120	9.7530	7.5335	6.1549	6.8723	8.9329	11.6029	15.2236	17.1951	18.9416 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-11.5970	-17.5776	-27.1425	-32.8629	-37.5447	-35.8322	-35.4038	-32.3664	-27.4013	-21.1006	-13.1800	-9.8888 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-3.2890	-7.1381	-14.6058	-22.5661	-30.4636	-30.8340	-30.4649	-25.5000	-18.3139	-10.4026	-4.4526	-2.5844 (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												1373.8405 (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												2624.4625 (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)	148.7360 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-502.5130 (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	3730.5260 (238)

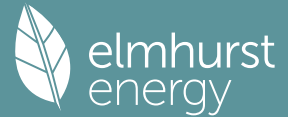
----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1373.8405	0.2100	288.5065 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2624.4625	0.2100	551.1371 (264)
Space and water heating			839.6436 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	148.7360	0.1443	21.4672 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-301.8979	0.1331	-40.1803
PV Unit electricity exported	-200.6150	0.1251	-25.0937
Total			-65.2740 (269)
Total CO2, kg/year			807.7661 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.2400 (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	1373.8405	1.1300	1552.4397 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2624.4625	1.1300	2965.6426 (278)
Space and water heating			4518.0824 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	148.7360	1.5338	228.1362 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-301.8979	1.4918	-450.3715
PV Unit electricity exported	-200.6150	0.4591	-92.1033
Total			-542.4748 (283)
Total Primary energy kWh/year			4333.8446 (286)
Target Primary Energy Rate (TPER)			71.0500 (287)

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Property Reference	13 Bedford Road_Copy			Issued on Date	27/02/2024
Assessment Reference	Flat 11- Heatpump_Copy	Prop Type Ref	13 Bedford Road		
Property	Flat 1, 13 Bedford Road, LONDON, N22 7AU				
SAP Rating	85 B	DER	3.89	TER	16.34
Environmental	97 A	% DER < TER			76.19
CO ₂ Emissions (t/year)	0.22	DFEE	39.93	TFEE	44.47
Compliance Check	See BREL	% DFEE < TFEE			10.22
% DPER < TPER	53.36	DPER	40.88	TPER	87.65
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client	EALConsult, Mark Simons				

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	64.0000 (1b)	2.6000 (2b)	166.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.0000		166.4000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	166.4000 (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) =	0.1202 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.2702	(18)
Number of sides sheltered	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2702 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.3445	0.3377	0.3310	0.2972	0.2905	0.2567	0.2567	0.2499	0.2702	0.2905	0.3040	0.3175 (22b)
	0.5593	0.5570	0.5548	0.5442	0.5422	0.5329	0.5329	0.5312	0.5365	0.5422	0.5462	0.5504 (25)

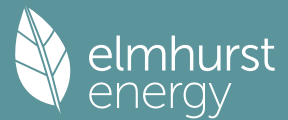
3. Heat losses and heat loss parameter

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
ENTRANCE DOOR			2.3400	0.8000	1.8720		(26)
WINDOWS (Uw = 0.80)			22.4300	0.7752	17.3876		(27)
EXTERNAL	91.8700	24.7700	67.1000	0.1500	10.0650	70.0000	4697.0000 (29a)
HALLWAY	9.7700		9.7700	0.1400	1.3678	70.0000	683.9000 (29a)
External Roof 1	64.0000		64.0000	0.1100	7.0400	9.0000	576.0000 (30)
Total net area of external elements Aum(A, m ²)			165.6400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.7324		(33)
Party Floor 1			64.0000			40.0000	2560.0000 (32d)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	12.4000	0.3000	3.7200
E2 Other lintels (including other steel lintels)	3.8000	0.0400	0.1520
E3 Sill	29.0400	0.0500	1.4520
E4 Jamb	36.3000	0.0700	2.5410
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.0900	1.2600
E16 Corner (normal)	2.8000	0.0600	0.1680
E18 Party wall between dwellings	36.3000	0.0400	1.4520
E14 Flat roof			

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E17 Corner (inverted - internal area greater than external area) 2.8000 -0.0900 -0.2520
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4930 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 48.2254 (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 30.7144 30.5879 30.4638 29.8813 29.7723 29.2650 29.2650 29.1710 29.4604 29.7723 29.9928 30.2233 (38)
 78.9398 78.8133 78.6892 78.1067 77.9977 77.4904 77.4904 77.3964 77.6858 77.9977 78.2182 78.4487 (39)
 Average = Sum(39)m / 12 = 78.1062

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 HLP (average) 1.2334 1.2315 1.2295 1.2204 1.2187 1.2108 1.2108 1.2093 1.2138 1.2187 1.2222 1.2258 (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 2.0922 (42)
 Hot water usage for mixer showers 59.2986 58.4075 57.1089 54.6243 52.7908 50.7460 49.5837 50.8725 52.2852 54.4806 57.0186 59.0714 (42a)
 Hot water usage for baths 26.9722 26.5716 26.0075 24.9674 24.1886 23.3250 22.8586 23.4187 24.0286 24.9527 26.0142 26.8810 (42b)
 Hot water usage for other uses 37.9537 36.5736 35.1934 33.8133 32.4332 31.0530 31.0530 32.4332 33.8133 35.1934 36.5736 37.9537 (42c)
 Average daily hot water use (litres/day) 114.1822 (43)
 Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 Energy conte 124.2245 121.5526 118.3098 113.4050 109.4125 105.1241 103.4954 106.7244 110.1271 114.6268 119.6064 123.9061 (44)
 Energy content (annual) 196.7412 173.0893 181.8378 155.2458 147.2903 129.2623 125.1687 132.1471 135.7978 155.5475 170.4012 194.0070 (45)
 Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1896.5361
 29.5112 25.9634 27.2757 23.2869 22.0935 19.3893 18.7753 19.8221 20.3697 23.3321 25.5602 29.1011 (46)
 Water storage loss:
 Store volume 200.0000 (47)
 a) If manufacturer declared loss factor is known (kWh/day): 2.1000 (48)
 Temperature factor from Table 2b 0.5400 (49)
 Enter (49) or (54) in (55) 1.1340 (55)
 Total storage loss
 35.1540 31.7520 35.1540 34.0200 35.1540 34.0200 35.1540 35.1540 34.0200 35.1540 34.0200 35.1540 (56)
 If cylinder contains dedicated solar storage
 35.1540 31.7520 35.1540 34.0200 35.1540 34.0200 35.1540 35.1540 34.0200 35.1540 34.0200 35.1540 (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
 255.1576 225.8525 240.2542 211.7778 205.7067 185.7943 183.5851 190.5635 192.3298 213.9639 226.9332 252.4234 (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
 255.1576 225.8525 240.2542 211.7778 205.7067 185.7943 183.5851 190.5635 192.3298 213.9639 226.9332 252.4234 (64)
 Total per year (kWh/year) = Sum(64)m = 2584.3421 (64)
 2584 (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
 112.1496 99.7628 107.1942 96.8448 95.7072 88.2053 88.3517 90.6720 90.3784 98.4526 101.8840 111.2405 (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 92.2575 102.1422 92.2575 95.3327 92.2575 95.3327 92.2575 92.2575 95.3327 92.2575 95.3327 92.2575 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 182.9108 184.8088 180.0258 169.8433 156.9898 144.9093 136.8388 134.9408 139.7238 149.9062 162.7598 174.8402 (68)
 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 33.4609 33.4609 33.4609 33.4609 33.4609 33.4609 33.4609 33.4609 33.4609 33.4609 33.4609 33.4609 (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) -83.6873 -83.6873 -83.6873 -83.6873 -83.6873 -83.6873 -83.6873 -83.6873 -83.6873 -83.6873 -83.6873 -83.6873 (71)
 Water heating gains (Table 5) 150.7387 148.4565 144.0782 134.5067 128.6386 122.5074 118.7523 121.8710 125.5255 132.3288 141.5056 149.5167 (72)
 Total internal gains 480.2896 489.7902 470.7442 454.0655 432.2687 417.1322 402.2313 403.4520 414.9647 428.8753 453.9807 470.9972 (73)

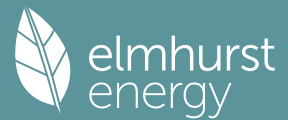
6. Solar gains

[Jan] Area m2 Solar flux Table 6a W/m2 g Specific data or Table 6b FF Specific data or Table 6c Access factor Table 6d Gains W
 North 0.3600 10.6334 0.5700 0.7000 1.0585 (74)
 East 16.9500 19.6403 0.5700 0.7000 92.0499 (76)
 West 5.1200 19.6403 0.5700 0.7000 27.8050 (80)
 Solar gains 120.9134 236.4844 389.5621 568.6612 697.5867 714.4526 680.0414 583.6578 453.2119 280.6163 150.7507 99.4452 (83)
 Total gains 601.2030 726.2746 860.3063 1022.7267 1129.8554 1131.5848 1082.2727 987.1098 868.1766 709.4916 604.7315 570.4424 (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	29.9697	30.0179	30.0652	30.2894	30.3317	30.5303	30.5303	30.5674	30.4535	30.3317	30.2462	30.1574
alpha	2.9980	3.0012	3.0043	3.0193	3.0221	3.0354	3.0354	3.0378	3.0302	3.0221	3.0164	3.0105
util living area	0.9460	0.9102	0.8445	0.7208	0.5696	0.4174	0.3085	0.3501	0.5535	0.7992	0.9164	0.9528 (86)
Living	20.2065	20.2985	20.4242	20.5595	20.6418	20.6810	20.6918	20.6899	20.6597	20.5361	20.3477	20.1905
Non living	18.9432	19.0586	19.2128	19.3773	19.4675	19.5115	19.5198	19.5200	19.4919	19.3578	19.1288	18.9288
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	20.5941	20.2985	20.4242	20.5595	20.6418	20.6810	20.6918	20.6899	20.6597	20.5361	20.3477	20.3037 (87)
Th 2	19.8933	19.8949	19.8965	19.9037	19.9051	19.9114	19.9114	19.9126	19.9089	19.9051	19.9023	19.8994 (88)
util rest of house	0.9367	0.8957	0.8206	0.6826	0.5174	0.3528	0.2348	0.2714	0.4828	0.7598	0.9003	0.9446 (89)
MIT 2	19.5145	19.0586	19.2128	19.3773	19.4675	19.5115	19.5198	19.5200	19.4919	19.3578	19.1288	19.1037 (90)
Living area fraction												
MIT	19.9531	19.5623	19.7050	19.8576	19.9446	19.9866	19.9959	19.9953	19.9663	19.8365	19.6240	0.4062 (91)
Temperature adjustment												0.0000
adjusted MIT	19.9531	19.5623	19.7050	19.8576	19.9446	19.9866	19.9959	19.9953	19.9663	19.8365	19.6240	19.5912 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9373	0.8908	0.8161	0.6809	0.5193	0.3574	0.2406	0.2775	0.4867	0.7571	0.8956	0.9419 (94)
Useful gains	563.4795	646.9597	702.0741	696.3420	586.7783	404.4135	260.4179	273.9683	422.5464	537.1488	541.6268	537.3188 (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	1235.6520	1155.5832	1039.0876	855.8603	643.0591	417.4101	263.1503	278.2610	455.7285	720.4248	979.6030	1207.4212 (97)
Space heating kWh	500.0963	341.7950	250.7380	114.8532	41.8729	0.0000	0.0000	0.0000	0.0000	136.3573	315.3429	498.5561 (98a)
Space heating requirement - total per year (kWh/year)												2199.6118
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	500.0963	341.7950	250.7380	114.8532	41.8729	0.0000	0.0000	0.0000	0.0000	136.3573	315.3429	498.5561 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2199.6118
Space heating per m2										(98c) / (4) =		34.3689 (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 %)												336.3261 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	500.0963	341.7950	250.7380	114.8532	41.8729	0.0000	0.0000	0.0000	0.0000	136.3573	315.3429	498.5561 (98)
Space heating efficiency (main heating system 1)	336.3261	336.3261	336.3261	336.3261	336.3261	0.0000	0.0000	0.0000	0.0000	336.3261	336.3261	336.3261 (210)
Space heating fuel (main heating system)	148.6939	101.6261	74.5521	34.1494	12.4501	0.0000	0.0000	0.0000	0.0000	40.5432	93.7611	148.2360 (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	255.1576	225.8525	240.2542	211.7778	205.7067	185.7943	183.5851	190.5635	192.3298	213.9639	226.9332	252.4234 (64)
Efficiency of water heater												291.6180 (216)
(217)m	291.6180	291.6180	291.6180	291.6180	291.6180	291.6180	291.6180	291.6180	291.6180	291.6180	291.6180	291.6180 (217)
Fuel for water heating, kWh/month	87.4972	77.4481	82.3866	72.6217	70.5398	63.7115	62.9540	65.3470	65.9526	73.3713	77.8187	86.5596 (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	19.0690	15.2979	13.7740	10.0915	7.7949	6.3685	7.1108	9.2429	12.0056	15.7520	17.7918	19.5990 (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												654.0117 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												291.6180
Water heating fuel used												886.2081 (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)												153.8979 (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	1694.1177 (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	654.0117	0.1564	102.2648 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	886.2081	0.1408	124.7917 (264)
Space and water heating			227.0565 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	153.8979	0.1443	22.2122 (268)
Total CO2, kg/year			249.2687 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8900 (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	654.0117	1.5788	1032.5845 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	886.2081	1.5207	1347.6390 (278)
Space and water heating			2380.2236 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	153.8979	1.5338	236.0538 (282)
Total Primary energy kWh/year			2616.2773 (286)
Dwelling Primary energy Rate (DPER)			40.8800 (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	64.0000 (1b)	x 2.6000 (2b)	= 166.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 166.4000 (5)

2. Ventilation rate

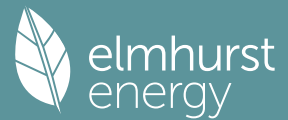
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1202 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3702 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3702 (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	0.4720	0.4627	0.4535	0.4072	0.3980	0.3517	0.3517	0.3424	0.3702	0.3980	0.4165	0.4350 (22b)
Effective ac	0.6114	0.6071	0.6028	0.5829	0.5792	0.5618	0.5618	0.5586	0.5685	0.5792	0.5867	0.5946 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			2.3400	1.0000	2.3400		(26)
TER Opening Type (Uw = 1.20)			13.6600	1.1450	15.6412		(27)
EXTERNAL	91.8700	16.0000	75.8700	0.1800	13.6566		(29a)
HALLWAY	9.7700		9.7700	0.1800	1.7586		(29a)
External Roof 1	64.0000		64.0000	0.1100	7.0400		(30)

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Total net area of external elements Aum(A, m2) 165.6400 (31)
Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 40.4364 (33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 133.0766 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	12.4000	0.0500	0.6200
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	29.0400	0.0500	1.4520
E7 Party floor between dwellings (in blocks of flats)	36.3000	0.0700	2.5410
E16 Corner (normal)	14.0000	0.0900	1.2600
E18 Party wall between dwellings	2.8000	0.0600	0.1680
E14 Flat roof	36.3000	0.0800	2.9040
E17 Corner (inverted - internal area greater than external area)	2.8000	-0.0900	-0.2520

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.8830 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 49.3194 (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	33.5726	33.3351	33.1023	32.0088	31.8042	30.8518	30.8518	30.6754	31.2186	31.8042	32.2181	32.6508
Heat transfer coeff	82.8921	82.6545	82.4217	81.3282	81.1236	80.1712	80.1712	79.9948	80.5381	81.1236	81.5375	81.9702
Average = Sum(39)m / 12 =												81.3272

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2952	1.2915	1.2878	1.2708	1.2676	1.2527	1.2527	1.2499	1.2584	1.2676	1.2740	1.2808
HLP (average)												1.2707
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0922 (42)

Hot water usage for mixer showers 59.2986 58.4075 57.1089 54.6243 52.7908 50.7460 49.5837 50.8725 52.2852 54.4806 57.0186 59.0714 (42a)

Hot water usage for baths 25.6236 25.2430 24.7071 23.7191 22.9792 22.1588 21.7157 22.2478 22.8272 23.7051 24.7135 25.5369 (42b)

Hot water usage for other uses 36.0560 34.7449 33.4338 32.1226 30.8115 29.5004 29.5004 30.8115 32.1226 33.4338 34.7449 36.0560 (42c)

Average daily hot water use (litres/day) 111.2066 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	120.9782	118.3954	115.2498	110.4660	106.5815	102.4052	100.7998	103.9318	107.2350	111.6195	116.4770	120.6644
Energy conte	191.5999	168.5935	177.1346	151.2224	143.4791	125.9191	121.9086	128.6893	132.2315	151.4666	165.9428	188.9313
Energy content (annual)										Total = Sum(45)m =		1847.1187

Distribution loss (46)m = 0.15 x (45)m 28.7400 25.2890 26.5702 22.6834 21.5219 18.8879 18.2863 19.3034 19.8347 22.7200 24.8914 28.3397 (46)

Water storage loss: 200.0000 (47)

Store volume 1.6525 (48)

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

Temperature factor from Table 2b 0.8924 (55)

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

Total storage loss 27.6637 24.9865 27.6637 26.7713 27.6637 26.7713 27.6637 27.6637 26.7713 27.6637 26.7713 27.6637 (56)

If cylinder contains dedicated solar storage 27.6637 24.9865 27.6637 26.7713 27.6637 26.7713 27.6637 27.6637 26.7713 27.6637 26.7713 27.6637 (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 242.5260 214.5912 228.0607 200.5057 194.4052 175.2024 172.8347 179.6154 181.5148 202.3926 215.2261 239.8573 (62)

WWHRS -27.1088 -23.9753 -25.1055 -20.7884 -19.3740 -16.5785 -15.5397 -16.5249 -17.1527 -20.2212 -22.9082 -26.6068 (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 215.4171 190.6159 202.9552 179.7174 175.0312 158.6239 157.2950 163.0905 164.3621 182.1714 192.3179 213.2505 (64)

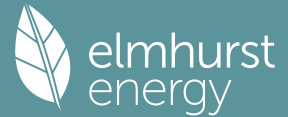
12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2194.8481 (64)

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 104.4478 92.8555 99.6381 89.7081 88.4477 81.2947 81.2755 83.5300 83.3936 91.1035 94.6026 103.5605 (65)

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East	10.3200		19.6403		0.6300		0.7000		0.7700		61.9439 (76)	
West	3.1200		19.6403		0.6300		0.7000		0.7700		18.7272 (80)	

Solar gains	81.3861	159.1762	262.2121	382.7639	469.5449	480.8981	457.7356	392.8586	305.0548	188.8812	101.4694	66.9361 (83)
Total gains	554.4811	641.8618	725.9575	830.0797	895.2133	888.5947	850.6130	786.8684	710.4809	611.0357	548.4996	530.7679 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	28.5408	28.6228	28.7037	29.0896	29.1630	29.5094	29.5094	29.5745	29.3750	29.1630	29.0149	28.8618
alpha	2.9027	2.9082	2.9136	2.9393	2.9442	2.9673	2.9673	2.9716	2.9583	2.9442	2.9343	2.9241
util living area	0.9567	0.9341	0.8929	0.8057	0.6796	0.5235	0.3963	0.4403	0.6497	0.8518	0.9349	0.9613 (86)
MIT	18.8223	19.1332	19.6023	20.1905	20.6245	20.8763	20.9597	20.9444	20.7575	20.1694	19.4079	18.7801 (87)
Th 2	19.8446	19.8475	19.8504	19.8638	19.8663	19.8781	19.8781	19.8803	19.8736	19.8663	19.8612	19.8559 (88)
util rest of house	0.9488	0.9225	0.8740	0.7722	0.6259	0.4471	0.3024	0.3432	0.5751	0.8179	0.9214	0.9542 (89)
MIT 2	17.3494	17.7397	18.3225	19.0378	19.5295	19.7924	19.8595	19.8526	19.6872	19.0354	18.0996	17.3032 (90)
Living area fraction									fLA = Living area / (4) =			0.4062 (91)
MIT	17.9477	18.3058	18.8424	19.5061	19.9744	20.2327	20.3064	20.2962	20.1220	19.4961	18.6311	17.9032 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9477	18.3058	18.8424	19.5061	19.9744	20.2327	20.3064	20.2962	20.1220	19.4961	18.6311	17.9032 (93)

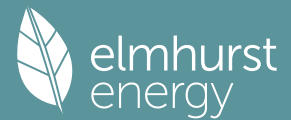
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9314	0.9025	0.8538	0.7603	0.6314	0.4722	0.3391	0.3804	0.5928	0.8048	0.9026	0.9378 (94)
Useful gains	516.4498	579.2606	619.8301	631.1020	565.2589	419.5989	288.4843	299.3536	421.1688	491.7909	495.0859	497.7587 (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	1131.2890	1108.0483	1017.2820	862.5732	671.2456	451.5815	297.1488	311.6729	484.9999	721.6798	940.2156	1123.2556 (97)
Space heating kWh	457.4403	355.3454	295.7042	166.6593	78.8541	0.0000	0.0000	0.0000	0.0000	171.0373	320.4934	465.3697 (98a)
Space heating requirement - total per year (kWh/year)												2310.9036
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	457.4403	355.3454	295.7042	166.6593	78.8541	0.0000	0.0000	0.0000	0.0000	171.0373	320.4934	465.3697 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2310.9036
Space heating per m2										(98c) / (4) =		36.1079 (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	457.4403	355.3454	295.7042	166.6593	78.8541	0.0000	0.0000	0.0000	0.0000	171.0373	320.4934	465.3697 (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)	495.6016	384.9896	320.3729	180.5626	85.4324	0.0000	0.0000	0.0000	0.0000	185.3058	347.2301	504.1925 (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	215.4171	190.6159	202.9552	179.7174	175.0312	158.6239	157.2950	163.0905	164.3621	182.1714	192.3179	213.2505 (64)
Efficiency of water heater (217)m	85.7054	85.4358	84.9028	83.8910	82.3936	79.8000	79.8000	79.8000	79.8000	83.9186	85.1965	79.8000 (216)
Fuel for water heating, kWh/month	251.3460	223.1100	239.0443	214.2273	212.4329	198.7768	197.1115	204.3740	205.9675	217.0812	225.7345	248.6579 (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	19.2019	15.4045	13.8701	10.1618	7.8493	6.4129	7.1604	9.3073	12.0893	15.8618	17.9158	19.7356 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-12.1522	-18.4106	-28.4154	-34.3859	-39.2668	-37.4668	-37.0165	-33.8482	-28.6683	-22.0910	-13.8073	-10.3630 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-3.4659	-7.5205	-15.3861	-23.7691	-32.0862	-32.4781	-32.0916	-26.8641	-19.2952	-10.9615	-4.6925	-2.7237 (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												2503.6876 (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												2637.8641 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	154.9706 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-527.2267 (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	4855.2956 (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	2503.6876	0.2100	525.7744 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2637.8641	0.2100	553.9515 (264)
Space and water heating			1079.7259 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	154.9706	0.1443	22.3671 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-315.8921	0.1331	-42.0463
PV Unit electricity exported	-211.3346	0.1251	-26.4348
Total			-68.4811 (269)
Total CO2, kg/year			1045.5410 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.3400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2503.6876	1.1300	2829.1670 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2637.8641	1.1300	2980.7864 (278)
Space and water heating			5809.9534 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	154.9706	1.5338	237.6991 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-315.8921	1.4918	-471.2612
PV Unit electricity exported	-211.3346	0.4591	-97.0257
Total			-568.2869 (283)
Total Primary energy kWh/year			5609.4664 (286)
Target Primary Energy Rate (TPER)			87.6500 (287)

1b. Be Lean SAP/SBEM Calculations

Project name

**Shop 1, 13 Bedford Road Improved NO
PV**

As designed

Date: Mon Jul 17 15:31:03 2023

Administrative information

Building Details

Address: 13 Bedford Road, Wood Green, LONDON, N22
7AU

Certifier details

Name: Mark Simons

Telephone number: 020 8930 5668

Address: 17 Dobree Avenue, London, NW10 2AD

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.c.0

Interface to calculation engine: Lifespan SBEM

Interface to calculation engine version: v6.1.c.0

BRUKL compliance module version: v6.1.c.0

Foundation area [m²]: 139.02The CO₂ emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	4.85
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	4.83
Target primary energy rate (TPER), kWh/m ² annum	52.43
Building primary energy rate (BPER), kWh/m ² annum	53.24
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _a -Limit	U _a -Calc	U _i -Calc	First surface with maximum value
Walls*	0.26	0.15	0.15	GF/01 SHOP/East/Wall-External
Floors	0.18	0.13	0.15	GF/02 TOILETS/Floor-External
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.11	0.11	GF/01 SHOP/Roof
Windows** and roof windows	1.6	0.8	0.8	GF/01 SHOP/East/Wall-External/Glazing
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

U_a-Limit = Limiting area-weighted average U-values [W/(m²K)]U_i-Calc = Calculated maximum individual element U-values [W/(m²K)]U_a-Calc = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	8

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Air Con

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	6.5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- Instantaneous

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
GF/02 TOILETS	0.3	-	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
GF/01 SHOP	247	50	3
GF/02 TOILETS	601	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF/01 SHOP	YES (+13.4%)	NO
GF/02 TOILETS	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	139	139
External area [m ²]	343.6	343.6
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	8	3
Average conductance [W/K]	66.08	123.88
Average U-value [W/m ² K]	0.19	0.36
Alpha value* [%]	35.72	20.88

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

100	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	5.4	10.5
Cooling	12.21	8.44
Auxiliary	0.32	0.43
Lighting	15.78	14.36
Hot water	1.65	1.65
Equipment*	20.24	20.24
TOTAL **	35.37	35.39

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	266.31	233.52
Primary energy [kWh/m ²]	53.24	52.43
Total emissions [kg/m ²]	4.83	4.85

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	63.4	202.9	5.4	12.2	0.3	3.26	4.62	3.5	6.5
	Notional	99.8	133.7	10.5	8.4	0.4	2.64	4.4	----	----

Key to terms

- Heat dem [MJ/m2] = Heating energy demand
- Cool dem [MJ/m2] = Cooling energy demand
- Heat con [kWh/m2] = Heating energy consumption
- Cool con [kWh/m2] = Cooling energy consumption
- Aux con [kWh/m2] = Auxiliary energy consumption
- Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
- Cool SSEER = Cooling system seasonal energy efficiency ratio
- Heat gen SSEFF = Heating generator seasonal efficiency
- Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
- ST = System type
- HS = Heat source
- HFT = Heating fuel type
- CFT = Cooling fuel type

Project name

**Shop 2, 13 Bedford Road Improved NO
PV**

As designed

Date: Mon Jul 17 15:32:24 2023

Administrative information

Building Details

Address: 13 Bedford Road, Wood Green, LONDON, N22 7AU

Certifier details

Name: Mark Simons

Telephone number: 020 8930 5668

Address: 17 Dobree Avenue, London, NW10 2AD

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.c.0

Interface to calculation engine: Lifespan SBEM

Interface to calculation engine version: v6.1.c.0

BRUKL compliance module version: v6.1.c.0

Foundation area [m²]: 119.35The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	5.3
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	4.96
Target primary energy rate (TPER), kWh/m ² annum	56.91
Building primary energy rate (BPER), kWh/m ² annum	54.42
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.15	0.15	GF/01 SHOP/East/Wall-External
Floors	0.18	0.13	0.15	GF/02 TOILETS/Floor-External
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.11	0.11	GF/01 SHOP/Roof
Windows** and roof windows	1.6	0.8	0.8	GF/01 SHOP/East/Wall-External/Glazing
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	8

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Air Con

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	6.5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- Instantaneous

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
GF/02 TOILETS	0.3	-	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
GF/01 SHOP	233	50	3
GF/02 TOILETS	599	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF/01 SHOP	YES (+34%)	NO
GF/02 TOILETS	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	119.4	119.4
External area [m ²]	353.3	353.3
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	8	3
Average conductance [W/K]	62.13	103.91
Average U-value [W/m ² K]	0.18	0.29
Alpha value* [%]	27.83	17.92

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

100	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	6.62	12.78
Cooling	11.32	6.79
Auxiliary	0.38	0.5
Lighting	16.12	16.56
Hot water	1.65	1.65
Equipment*	20.23	20.23
TOTAL **	36.09	38.28

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>0</i>

Energy & CO₂ Emissions Summary

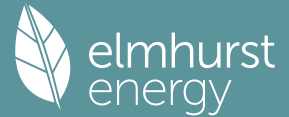
	Actual	Notional
Heating + cooling demand [MJ/m ²]	265.79	229.07
Primary energy [kWh/m ²]	54.42	56.91
Total emissions [kg/m ²]	4.96	5.3

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	77.7	188	6.6	11.3	0.4	3.26	4.62	3.5	6.5
	Notional	121.5	107.6	12.8	6.8	0.5	2.64	4.4	----	----

Key to terms	
Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

1c. Be Green SAP/SBEM Calculations

Full SAP Calculation Printout



Property Reference	13 Bedford Road_Copy			Issued on Date	27/02/2024
Assessment Reference	Flat 11 - Heatpump+PV	Prop Type Ref	13 Bedford Road		
Property	Flat 1, 13 Bedford Road, LONDON, N22 7AU				
SAP Rating	88 B	DER	3.18	TER	16.34
Environmental	98 A	% DER < TER			80.54
CO ₂ Emissions (t/year)	0.18	DFEE	39.93	TFEE	44.47
Compliance Check	See BREL	% DFEE < TFEE			10.22
% DPER < TPER	62.56	DPER	32.81	TPER	87.65
Assessor Details	Mr. Mark Simons			Assessor ID	5542-0001
Client	EALConsult, Mark Simons				

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	64.0000 (1b)	2.6000 (2b)	166.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.0000		166.4000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	166.4000 (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) =	0.1202 (8)	
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	3.0000	(17)	
Infiltration rate	0.2702	(18)	
Number of sides sheltered	0	(19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2702 (21)	

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.3445	0.3377	0.3310	0.2972	0.2905	0.2567	0.2567	0.2499	0.2702	0.2905	0.3040	0.3175 (22b)
	0.5593	0.5570	0.5548	0.5442	0.5422	0.5329	0.5329	0.5312	0.5365	0.5422	0.5462	0.5504 (25)

3. Heat losses and heat loss parameter

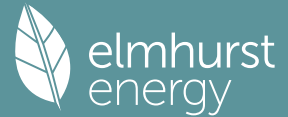
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
ENTRANCE DOOR			2.3400	0.8000	1.8720		(26)
WINDOWS (Uw = 0.80)			22.4300	0.7752	17.3876		(27)
EXTERNAL	91.8700	24.7700	67.1000	0.1500	10.0650	70.0000	4697.0000 (29a)
HALLWAY	9.7700		9.7700	0.1400	1.3678	70.0000	683.9000 (29a)
External Roof 1	64.0000		64.0000	0.1100	7.0400	9.0000	576.0000 (30)
Total net area of external elements Aum(A, m ²)			165.6400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.7324		(33)
Party Floor 1			64.0000			40.0000	2560.0000 (32d)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 8516.9000 (34)
133.0766 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	12.4000	0.3000	3.7200
E3 Sill	3.8000	0.0400	0.1520
E4 Jamb	29.0400	0.0500	1.4520
E7 Party floor between dwellings (in blocks of flats)	36.3000	0.0700	2.5410
E16 Corner (normal)	14.0000	0.0900	1.2600
E18 Party wall between dwellings	2.8000	0.0600	0.1680
E14 Flat roof	36.3000	0.0400	1.4520

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E17 Corner (inverted - internal area greater than external area) 2.8000 -0.0900 -0.2520
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4930 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.2254 (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	30.7144	30.5879	30.4638	29.8813	29.7723	29.2650	29.2650	29.1710	29.4604	29.7723	29.9928	30.2233
Average = Sum(39)m / 12 =	78.9398	78.8133	78.6892	78.1067	77.9977	77.4904	77.4904	77.3964	77.6858	77.9977	78.2182	78.4487
HLP	1.2334	1.2315	1.2295	1.2204	1.2187	1.2108	1.2108	1.2093	1.2138	1.2187	1.2222	1.2258
HLP (average)												1.2204
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0922 (42)											
Hot water usage for mixer showers	59.2986	58.4075	57.1089	54.6243	52.7908	50.7460	49.5837	50.8725	52.2852	54.4806	57.0186	59.0714
Hot water usage for baths	26.9722	26.5716	26.0075	24.9674	24.1886	23.3250	22.8586	23.4187	24.0286	24.9527	26.0142	26.8810
Hot water usage for other uses	37.9537	36.5736	35.1934	33.8133	32.4332	31.0530	31.0530	32.4332	33.8133	35.1934	36.5736	37.9537
Average daily hot water use (litres/day)	124.2245	121.5526	118.3098	113.4050	109.4125	105.1241	103.4954	106.7244	110.1271	114.6268	119.6064	123.9061
Daily hot water use	196.7412	173.0893	181.8378	155.2458	147.2903	129.2623	125.1687	132.1471	135.7978	155.5475	170.4012	194.0070
Energy content (annual)	29.5112	25.9634	27.2757	23.2869	22.0935	19.3893	18.7753	19.8221	20.3697	23.3321	25.5602	29.1011
Distribution loss (46)m = 0.15 x (45)m	25.5112	25.9634	27.2757	23.2869	22.0935	19.3893	18.7753	19.8221	20.3697	23.3321	25.5602	29.1011
Water storage loss:	200.0000 (47)											
Store volume	2.1000 (48)											
a) If manufacturer declared loss factor is known (kWh/day):	0.5400 (49)											
Temperature factor from Table 2b	1.1340 (55)											
Enter (49) or (54) in (55)												
Total storage loss	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540
If cylinder contains dedicated solar storage	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540
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	255.1576	225.8525	240.2542	211.7778	205.7067	185.7943	183.5851	190.5635	192.3298	213.9639	226.9332	252.4234
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
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	255.1576	225.8525	240.2542	211.7778	205.7067	185.7943	183.5851	190.5635	192.3298	213.9639	226.9332	252.4234
12Total per year (kWh/year)	2584.3421 (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
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000 (64a)											
Heat gains from water heating, kWh/month	112.1496	99.7628	107.1942	96.8448	95.7072	88.2053	88.3517	90.6720	90.3784	98.4526	101.8840	111.2405

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

Metabolic gains (Table 5), Watts	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091
(66)m	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	92.2575	102.1422	92.2575	95.3327	92.2575	95.3327	92.2575	92.2575	95.3327	92.2575	95.3327	92.2575
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	182.9108	184.8088	180.0258	169.8433	156.9898	144.9093	136.8388	134.9408	139.7238	149.9062	162.7598	174.8402
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609
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
Losses e.g. evaporation (negative values) (Table 5)	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873
Water heating gains (Table 5)	150.7387	148.4565	144.0782	134.5067	128.6386	122.5074	118.7523	121.8710	125.5255	132.3288	141.5056	149.5167
Total internal gains	480.2896	489.7902	470.7442	454.0655	432.2687	417.1322	402.2313	403.4520	414.9647	428.8753	453.9807	470.9972

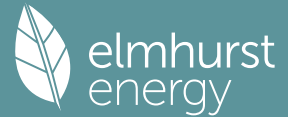
6. Solar gains

[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	
North	0.3600	10.6334	0.5700	0.7000	0.7700	1.0585 (74)
East	16.9500	19.6403	0.5700	0.7000	0.7700	92.0499 (76)
West	5.1200	19.6403	0.5700	0.7000	0.7700	27.8050 (80)
Solar gains	120.9134	236.4844	389.5621	568.6612	697.5867	714.4526
Total gains	601.2030	726.2746	860.3063	1022.7267	1129.8554	1131.5848

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	29.9697	30.0179	30.0652	30.2894	30.3317	30.5303	30.5303	30.5674	30.4535	30.3317	30.2462	30.1574
alpha	2.9980	3.0012	3.0043	3.0193	3.0221	3.0354	3.0354	3.0378	3.0302	3.0221	3.0164	3.0105
util living area	0.9460	0.9102	0.8445	0.7208	0.5696	0.4174	0.3085	0.3501	0.5535	0.7992	0.9164	0.9528 (86)
Living	20.2065	20.2985	20.4242	20.5595	20.6418	20.6810	20.6918	20.6899	20.6597	20.5361	20.3477	20.1905
Non living	18.9432	19.0586	19.2128	19.3773	19.4675	19.5115	19.5198	19.5200	19.4919	19.3578	19.1288	18.9288
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	20.5941	20.2985	20.4242	20.5595	20.6418	20.6810	20.6918	20.6899	20.6597	20.5361	20.3477	20.3037 (87)
Th 2	19.8933	19.8949	19.8965	19.9037	19.9051	19.9114	19.9114	19.9126	19.9089	19.9051	19.9023	19.8994 (88)
util rest of house	0.9367	0.8957	0.8206	0.6826	0.5174	0.3528	0.2348	0.2714	0.4828	0.7598	0.9003	0.9446 (89)
MIT 2	19.5145	19.0586	19.2128	19.3773	19.4675	19.5115	19.5198	19.5200	19.4919	19.3578	19.1288	19.1037 (90)
Living area fraction												0.4062 (91)
MIT	19.9531	19.5623	19.7050	19.8576	19.9446	19.9866	19.9959	19.9953	19.9663	19.8365	19.6240	19.5912 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9531	19.5623	19.7050	19.8576	19.9446	19.9866	19.9959	19.9953	19.9663	19.8365	19.6240	19.5912 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9373	0.8908	0.8161	0.6809	0.5193	0.3574	0.2406	0.2775	0.4867	0.7571	0.8956	0.9419 (94)
Useful gains	563.4795	646.9597	702.0741	696.3420	586.7783	404.4135	260.4179	273.9683	422.5464	537.1488	541.6268	537.3188 (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	1235.6520	1155.5832	1039.0876	855.8603	643.0591	417.4101	263.1503	278.2610	455.7285	720.4248	979.6030	1207.4212 (97)
Space heating kWh	500.0963	341.7950	250.7380	114.8532	41.8729	0.0000	0.0000	0.0000	0.0000	136.3573	315.3429	498.5561 (98a)
Space heating requirement - total per year (kWh/year)												2199.6118
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	500.0963	341.7950	250.7380	114.8532	41.8729	0.0000	0.0000	0.0000	0.0000	136.3573	315.3429	498.5561 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2199.6118
Space heating per m2										(98c) / (4) =		34.3689 (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 %)												336.3261 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	500.0963	341.7950	250.7380	114.8532	41.8729	0.0000	0.0000	0.0000	0.0000	136.3573	315.3429	498.5561 (98)
Space heating efficiency (main heating system 1)	336.3261	336.3261	336.3261	336.3261	336.3261	0.0000	0.0000	0.0000	0.0000	336.3261	336.3261	336.3261 (210)
Space heating fuel (main heating system)	148.6939	101.6261	74.5521	34.1494	12.4501	0.0000	0.0000	0.0000	0.0000	40.5432	93.7611	148.2360 (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	255.1576	225.8525	240.2542	211.7778	205.7067	185.7943	183.5851	190.5635	192.3298	213.9639	226.9332	252.4234 (64)
Efficiency of water heater	291.6180	291.6180	291.6180	291.6180	291.6180	291.6180	291.6180	291.6180	291.6180	291.6180	291.6180	291.6180 (216)
Fuel for water heating, kWh/month	87.4972	77.4481	82.3866	72.6217	70.5398	63.7115	62.9540	65.3470	65.9526	73.3713	77.8187	86.5596 (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	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	19.0690	15.2979	13.7740	10.0915	7.7949	6.3685	7.1108	9.2429	12.0056	15.7520	17.7918	19.5990 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-9.7038	-16.8304	-30.0197	-40.1691	-48.0617	-46.2189	-45.2743	-39.8001	-30.8649	-21.1820	-11.4844	-7.9502 (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												654.0117 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												291.6180
Water heating fuel used												886.2081 (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)												153.8979 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-347.5597 (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	1346.5580 (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	654.0117	0.1564	102.2648 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	886.2081	0.1408	124.7917 (264)
Space and water heating			227.0565 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	153.8979	0.1443	22.2122 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-347.5597	0.1314	-45.6616
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-45.6616 (269)
Total CO ₂ , kg/year			203.6072 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.1800 (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	654.0117	1.5788	1032.5845 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	886.2081	1.5207	1347.6390 (278)
Space and water heating			2380.2236 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	153.8979	1.5338	236.0538 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-347.5597	1.4854	-516.2554
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-516.2554 (283)
Total Primary energy kWh/year			2100.0219 (286)
Dwelling Primary energy Rate (DPER)			32.8100 (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	64.0000 (1b)	x 2.6000 (2b)	= 166.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 166.4000 (5)

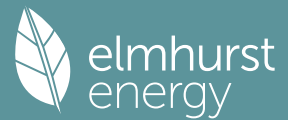
2. Ventilation rate

	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) =	0.1202 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3702	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3702	(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	0.4720	0.4627	0.4535	0.4072	0.3980	0.3517	0.3517	0.3424	0.3702	0.3980	0.4165	0.4350 (22b)
Effective ac	0.6114	0.6071	0.6028	0.5829	0.5792	0.5618	0.5618	0.5586	0.5685	0.5792	0.5867	0.5946 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3400	1.0000	2.3400			(26)
TER Opening Type (Uw = 1.20)			13.6600	1.1450	15.6412			(27)
EXTERNAL	91.8700	16.0000	75.8700	0.1800	13.6566			(29a)
HALLWAY	9.7700		9.7700	0.1800	1.7586			(29a)
External Roof 1	64.0000		64.0000	0.1100	7.0400			(30)
Total net area of external elements Aum(A, m2)			165.6400					(31)
Fabric heat loss, W/K = Sum (A x U)					40.4364			(33)

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

133.0766 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	12.4000	0.0500	0.6200	
E2 Other lintels (including other steel lintels)	3.8000	0.0500	0.1900	
E3 Sill	29.0400	0.0500	1.4520	
E4 Jamb	36.3000	0.0700	2.5410	
E7 Party floor between dwellings (in blocks of flats)	14.0000	0.0900	1.2600	
E16 Corner (normal)	2.8000	0.0600	0.1680	
E18 Party wall between dwellings	36.3000	0.0800	2.9040	
E14 Flat roof	2.8000	-0.0900	-0.2520	
E17 Corner (inverted - internal area greater than external area)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				8.8830 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 49.3194 (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	33.5726	33.3351	33.1023	32.0088	31.8042	30.8518	30.8518	30.6754	31.2186	31.8042	32.2181	32.6508	(38)
Heat transfer coeff	82.8921	82.6545	82.4217	81.3282	81.1236	80.1712	80.1712	79.9948	80.5381	81.1236	81.5375	81.9702	(39)
Average = Sum(39)m / 12 =													81.3272

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2952	1.2915	1.2878	1.2708	1.2676	1.2527	1.2527	1.2499	1.2584	1.2676	1.2740	1.2808	(40)
HLP (average)													1.2707
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

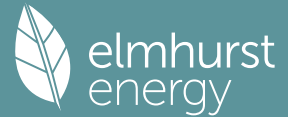
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0922 (42)
Hot water usage for mixer showers	59.2986	58.4075	57.1089	54.6243	52.7908	50.7460	49.5837	50.8725	52.2852	54.4806	57.0186	59.0714	(42a)
Hot water usage for baths	25.6236	25.2430	24.7071	23.7191	22.9792	22.1588	21.7157	22.2478	22.8272	23.7051	24.7135	25.5369	(42b)
Hot water usage for other uses	36.0560	34.7449	33.4338	32.1226	30.8115	29.5004	29.5004	30.8115	32.1226	33.4338	34.7449	36.0560	(42c)
Average daily hot water use (litres/day)													111.2066 (43)
Daily hot water use	120.9782	118.3954	115.2498	110.4660	106.5815	102.4052	100.7998	103.9318	107.2350	111.6195	116.4770	120.6644	(44)
Energy conte	191.5999	168.5935	177.1346	151.2224	143.4791	125.9191	121.9086	128.6893	132.2315	151.4666	165.9428	188.9313	(45)
Energy content (annual)										Total = Sum(45)m =		1847.1187	
Distribution loss (46)m = 0.15 x (45)m	28.7400	25.2890	26.5702	22.6834	21.5219	18.8879	18.2863	19.3034	19.8347	22.7200	24.8914	28.3397	(46)
Water storage loss:													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6525 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8924 (55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(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	242.5260	214.5912	228.0607	200.5057	194.4052	175.2024	172.8347	179.6154	181.5148	202.3926	215.2261	239.8573	(62)
WWHRS	-27.1088	-23.9753	-25.1055	-20.7884	-19.3740	-16.5785	-15.5397	-16.5249	-17.1527	-20.2212	-22.9082	-26.6068	(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	215.4171	190.6159	202.9552	179.7174	175.0312	158.6239	157.2950	163.0905	164.3621	182.1714	192.3179	213.2505	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2194.8481	(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	104.4478	92.8555	99.6381	89.7081	88.4477	81.2947	81.2755	83.5300	83.3936	91.1035	94.6026	103.5605	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	104.6091	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	92.4146	102.3162	92.4146	95.4951	92.4146	95.4951	92.4146	92.4146	95.4951	92.4146	95.4951	92.4146	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	182.9108	184.8088	180.0258	169.8433	156.9898	144.9093	136.8388	134.9408	139.7238	149.9062	162.7598	174.8402	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	33.4609	(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)	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	-83.6873	(71)
Water heating gains (Table 5)	140.3869	138.1779	133.9222	124.5946	118.8813	112.9094	109.2412	112.2716	115.8245	122.4509	131.3925	139.1942	(72)
Total internal gains	473.0950	482.6856	463.7454	447.3158	425.6685	407.6966	392.8774	394.0097	405.4261	422.1545	447.0301	463.8318	(73)

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6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North			0.2200	10.6334		0.6300		0.7000	0.7700	0.7149 (74)
East			10.3200	19.6403		0.6300		0.7000	0.7700	61.9439 (76)
West			3.1200	19.6403		0.6300		0.7000	0.7700	18.7272 (80)
Solar gains	81.3861	159.1762	262.2121	382.7639	469.5449	480.8981	457.7356	392.8586	305.0548	66.9361 (83)
Total gains	554.4811	641.8618	725.9575	830.0797	895.2133	888.5947	850.6130	786.8684	710.4809	530.7679 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	28.5408	28.6228	28.7037	29.0896	29.1630	29.5094	29.5094	29.5745	29.3750	29.1630	29.0149	28.8618
alpha	2.9027	2.9082	2.9136	2.9393	2.9442	2.9673	2.9673	2.9716	2.9583	2.9442	2.9343	2.9241
util living area	0.9567	0.9341	0.8929	0.8057	0.6796	0.5235	0.3963	0.4403	0.6497	0.8518	0.9349	0.9613 (86)
MIT	18.8223	19.1332	19.6023	20.1905	20.6245	20.8763	20.9597	20.9444	20.7575	20.1694	19.4079	18.7801 (87)
Th 2	19.8446	19.8475	19.8504	19.8638	19.8663	19.8781	19.8781	19.8803	19.8736	19.8663	19.8612	19.8559 (88)
util rest of house	0.9488	0.9225	0.8740	0.7722	0.6259	0.4471	0.3024	0.3432	0.5751	0.8179	0.9214	0.9542 (89)
MIT 2	17.3494	17.7397	18.3225	19.0378	19.5295	19.7924	19.8595	19.8526	19.6872	19.0354	18.0996	17.3032 (90)
Living area fraction									fLA = Living area / (4) =			0.4062 (91)
MIT	17.9477	18.3058	18.8424	19.5061	19.9744	20.2327	20.3064	20.2962	20.1220	19.4961	18.6311	17.9032 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9477	18.3058	18.8424	19.5061	19.9744	20.2327	20.3064	20.2962	20.1220	19.4961	18.6311	17.9032 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9314	0.9025	0.8538	0.7603	0.6314	0.4722	0.3391	0.3804	0.5928	0.8048	0.9026	0.9378 (94)
Useful gains	516.4498	579.2606	619.8301	631.1020	565.2589	419.5989	288.4843	299.3536	421.1688	491.7909	495.0859	497.7587 (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	1131.2890	1108.0483	1017.2820	862.5732	671.2456	451.5815	297.1488	311.6729	484.9999	721.6798	940.2156	1123.2556 (97)
Space heating kWh	457.4403	355.3454	295.7042	166.6593	78.8541	0.0000	0.0000	0.0000	0.0000	171.0373	320.4934	465.3697 (98a)
Space heating requirement - total per year (kWh/year)												2310.9036
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	457.4403	355.3454	295.7042	166.6593	78.8541	0.0000	0.0000	0.0000	0.0000	171.0373	320.4934	465.3697 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2310.9036
Space heating per m2										(98c) / (4) =		36.1079 (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	457.4403	355.3454	295.7042	166.6593	78.8541	0.0000	0.0000	0.0000	0.0000	171.0373	320.4934	465.3697 (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)	495.6016	384.9896	320.3729	180.5626	85.4324	0.0000	0.0000	0.0000	0.0000	185.3058	347.2301	504.1925 (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	215.4171	190.6159	202.9552	179.7174	175.0312	158.6239	157.2950	163.0905	164.3621	182.1714	192.3179	213.2505 (64)
Efficiency of water heater	85.7054	85.4358	84.9028	83.8910	82.3936	79.8000	79.8000	79.8000	79.8000	83.9186	85.1965	79.8000 (216)
Fuel for water heating, kWh/month	251.3460	223.1100	239.0443	214.2273	212.4329	198.7768	197.1115	204.3740	205.9675	217.0812	225.7345	248.6579 (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	19.2019	15.4045	13.8701	10.1618	7.8493	6.4129	7.1604	9.3073	12.0893	15.8618	17.9158	19.7356 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-12.1522	-18.4106	-28.4154	-34.3859	-39.2668	-37.4668	-37.0165	-33.8482	-28.6683	-22.0910	-13.8073	-10.3630 (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)	-3.4659	-7.5205	-15.3861	-23.7691	-32.0862	-32.4781	-32.0916	-26.8641	-19.2952	-10.9615	-4.6925	-2.7237 (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)												

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(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												2503.6876	(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												2637.8641	(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)												154.9706	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-527.2267	(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												4855.2956	(238)

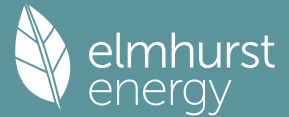
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2503.6876	0.2100	525.7744	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2637.8641	0.2100	553.9515	(264)
Space and water heating			1079.7259	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	154.9706	0.1443	22.3671	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-315.8921	0.1331	-42.0463	
PV Unit electricity exported	-211.3346	0.1251	-26.4348	
Total			-68.4811	(269)
Total CO2, kg/year			1045.5410	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.3400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2503.6876	1.1300	2829.1670	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2637.8641	1.1300	2980.7864	(278)
Space and water heating			5809.9534	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	154.9706	1.5338	237.6991	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-315.8921	1.4918	-471.2612	
PV Unit electricity exported	-211.3346	0.4591	-97.0257	
Total			-568.2869	(283)
Total Primary energy kWh/year			5609.4664	(286)
Target Primary Energy Rate (TPER)			87.6500	(287)

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Property Reference	13 Bedford Road_Copy			Issued on Date	27/02/2024
Assessment Reference	Flat 4 - Heatpump+PV_Copy	Prop Type Ref	13 Bedford Road		
Property	Flat 1, 13 Bedford Road, LONDON, N22 7AU				
SAP Rating	91 B	DER	2.17	TER	11.92
Environmental	98 A	% DER < TER			81.80
CO ₂ Emissions (t/year)	0.16	DFEE	26.38	TFEE	31.13
Compliance Check	See BREL	% DFEE < TFEE			15.28
% DPER < TPER	64.87	DPER	22.34	TPER	63.58
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	87.0000	2.6000	226.2000
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		
Dwelling volume			

2. Ventilation rate

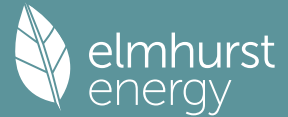
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked 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) =	0.0884 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.2384	(18)
Number of sides sheltered	0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2384 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.3040	0.2980	0.2921	0.2623	0.2563	0.2265	0.2265	0.2205	0.2384	0.2563	0.2682	0.2801 (22b)
	0.5462	0.5444	0.5426	0.5344	0.5328	0.5257	0.5257	0.5243	0.5284	0.5328	0.5360	0.5392 (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
ENTRANCE DOOR			2.3400	0.8000	1.8720		(26)
WINDOWS (Uw = 0.80)			25.5000	0.7752	19.7674		(27)
EXTERNAL	86.2100	27.8400	58.3700	0.1500	8.7555	70.0000	4085.9000 (29a)
External Roof 1	6.3100		6.3100	0.1100	0.6941	9.0000	56.7900 (30)
Total net area of external elements Aum(A, m ²)			92.5200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.0890		(33)
Party Wall 1			21.2700	0.0000	0.0000	180.0000	3828.6000 (32)
Party Floor 1			87.0000			40.0000	3480.0000 (32d)
Party Ceiling 1			80.6900			30.0000	2420.7000 (32b)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13871.9900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							159.4482 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				12.2600	0.3000	3.6780	
E3 Sill				4.8000	0.0400	0.1920	
E4 Jamb				27.9200	0.0500	1.3960	
E7 Party floor between dwellings (in blocks of flats)				58.6100	0.0700	4.1027	
E16 Corner (normal)				10.4000	0.0900	0.9360	
E18 Party wall between dwellings				5.2000	0.0600	0.3120	

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P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3600	0.0000	0.0000										
E14 Flat roof	7.7100	0.0400	0.3084										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				10.9251 (36)									
Point Thermal bridges			(36a) =	0.0000									
Total fabric heat loss		(33) + (36) + (36a) =		42.0141 (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	40.7718	40.6379	40.5066	39.8901	39.7747	39.2377	39.2377	39.1382	39.4445	39.7747	40.0081	40.2521	(38)
Average = Sum(39)m / 12 =	82.7860	82.6521	82.5208	81.9042	81.7889	81.2518	81.2518	81.1524	81.4587	81.7889	82.0222	82.2662	(39)
												81.9037	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9516	0.9500	0.9485	0.9414	0.9401	0.9339	0.9339	0.9328	0.9363	0.9401	0.9428	0.9456	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												0.9414	
												31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5824 (42)
Hot water usage for mixer showers													
Hot water usage for baths	67.5179	66.5033	65.0247	62.1958	60.1080	57.7799	56.4565	57.9239	59.5324	62.0322	64.9219	67.2593	(42a)
Hot water usage for other uses	30.6928	30.2370	29.5951	28.4115	27.5253	26.5426	26.0118	26.6492	27.3432	28.3947	29.6027	30.5890	(42b)
Average daily hot water use (litres/day)	43.2382	41.6659	40.0936	38.5213	36.9490	35.3767	35.3767	36.9490	38.5213	40.0936	41.6659	43.2382	(42c)
												130.0138	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	141.4489	138.4061	134.7133	129.1285	124.5823	119.6991	117.8450	121.5221	125.3969	130.5205	136.1904	141.0865	(44)
Energy content (annual)	224.0205	197.0885	207.0494	176.7705	167.7117	147.1840	142.5233	150.4697	154.6269	177.1151	194.0282	220.9073	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	33.6031	29.5633	31.0574	26.5156	25.1568	22.0776	21.3785	22.5705	23.1940	26.5673	29.1042	33.1361	(46)
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.1000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.1340 (55)
Total storage loss													
If cylinder contains dedicated solar storage	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(56)
Primary loss	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(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	282.4369	249.8517	265.4658	233.3025	226.1281	203.7160	200.9397	208.8861	211.1589	235.5315	250.5602	279.3237	(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	282.4369	249.8517	265.4658	233.3025	226.1281	203.7160	200.9397	208.8861	211.1589	235.5315	250.5602	279.3237	(64)
12Total per year (kWh/year)													2847.3011 (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	121.2199	107.7425	115.5770	104.0018	102.4973	94.1643	94.1221	96.7643	96.6390	105.6239	109.7400	120.1848	(65)

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

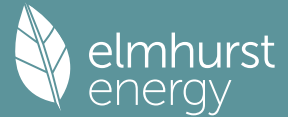
Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	117.7482	130.3641	117.7482	121.6731	117.7482	121.6731	117.7482	117.7482	121.6731	117.7482	121.6731	117.7482	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486	(68)
Pumps, fans	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	(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)	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	(71)
Total internal gains	162.9300	160.3311	155.3455	144.4469	137.7651	130.7837	126.5082	130.0595	134.2209	141.9676	152.4167	161.5387	(72)
	575.8631	588.3025	564.5965	544.6270	517.6153	499.1405	480.6397	481.7685	495.9594	512.7770	543.5559	564.1714	(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								
North	4.5000	10.6334	0.5700	0.7000	0.7700	13.2309	(74)						
East	10.3800	19.6403	0.5700	0.7000	0.7700	56.3704	(76)						
South	9.9000	46.7521	0.5700	0.7000	0.7700	127.9800	(78)						
West	0.7200	19.6403	0.5700	0.7000	0.7700	3.9101	(80)						
Solar gains	201.4914	352.8046	504.1560	653.9998	754.5250	757.4660	726.8775	651.4412	556.4242	396.0935	243.1846	171.1882	(83)
Total gains	777.3545	941.1071	1068.7525	1198.6268	1272.1403	1256.6066	1207.5172	1133.2097	1052.3836	908.8705	786.7406	735.3595	(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	46.5457	46.6211	46.6953	47.0468	47.1132	47.4245	47.4245	47.4827	47.3041	47.1132	46.9791	46.8398	
alpha	4.1030	4.1081	4.1130	4.1365	4.1409	4.1616	4.1616	4.1655	4.1536	4.1409	4.1319	4.1227	
util living area	0.9565	0.9150	0.8470	0.7222	0.5672	0.4076	0.2948	0.3272	0.5149	0.7779	0.9214	0.9639 (86)	
Living	20.4836	20.5608	20.6422	20.7188	20.7583	20.7737	20.7766	20.7764	20.7677	20.7107	20.5865	20.4686	
Non living	19.5001	19.5963	19.6952	19.7886	19.8311	19.8506	19.8527	19.8537	19.8438	19.7833	19.6353	19.4861	
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	20.7358	20.5608	20.6422	20.7188	20.7583	20.7737	20.7766	20.7764	20.7677	20.7107	20.5865	20.5429 (87)	
Th 2	20.1239	20.1252	20.1265	20.1324	20.1335	20.1388	20.1388	20.1397	20.1367	20.1335	20.1313	20.1289 (88)	
util rest of house	0.9486	0.9012	0.8243	0.6872	0.5216	0.3549	0.2377	0.2670	0.4565	0.7394	0.9061	0.9572 (89)	
MIT 2	19.8752	19.5963	19.6952	19.7886	19.8311	19.8506	19.8527	19.8537	19.8438	19.7833	19.6353	19.6019 (90)	
Living area fraction									fLA = Living area / (4) =				0.3333 (91)
MIT	20.1621	19.9178	20.0108	20.0987	20.1402	20.1583	20.1606	20.1612	20.1518	20.0924	19.9524	19.9156 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.1621	19.9178	20.0108	20.0987	20.1402	20.1583	20.1606	20.1612	20.1518	20.0924	19.9524	19.9156 (93)	

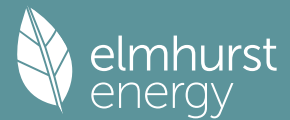
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9490	0.8975	0.8210	0.6857	0.5220	0.3561	0.2391	0.2685	0.4575	0.7374	0.9026	0.9554 (94)	
Useful gains	737.7226	844.6723	877.4984	821.9181	664.0618	447.5112	288.7317	304.2876	481.5081	670.2079	710.0962	702.5690 (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	1313.1577	1241.2513	1114.9255	917.2174	690.3103	451.6232	289.3074	305.2335	492.9678	776.3765	1054.1803	1292.8627 (97)	
Space heating kWh	428.1237	266.5011	176.6458	68.6155	19.5289	0.0000	0.0000	0.0000	0.0000	78.9894	247.7406	439.1785 (98a)	
Space heating requirement - total per year (kWh/year)												1725.3235	
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	428.1237	266.5011	176.6458	68.6155	19.5289	0.0000	0.0000	0.0000	0.0000	78.9894	247.7406	439.1785 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1725.3235	
Space heating per m2										(98c) / (4) =		19.8313 (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 %)													337.0975 (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	428.1237	266.5011	176.6458	68.6155	19.5289	0.0000	0.0000	0.0000	0.0000	78.9894	247.7406	439.1785 (98)	
Space heating efficiency (main heating system 1)	337.0975	337.0975	337.0975	337.0975	337.0975	0.0000	0.0000	0.0000	0.0000	337.0975	337.0975	337.0975 (210)	
Space heating fuel (main heating system)	127.0029	79.0576	52.4020	20.3548	5.7933	0.0000	0.0000	0.0000	0.0000	23.4322	73.4923	130.2823 (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	282.4369	249.8517	265.4658	233.3025	226.1281	203.7160	200.9397	208.8861	211.1589	235.5315	250.5602	279.3237 (64)	
Efficiency of water heater												291.4090 (216)	
(217)m	291.4090	291.4090	291.4090	291.4090	291.4090	291.4090	291.4090	291.4090	291.4090	291.4090	291.4090	291.4090 (217)	
Fuel for water heating, kWh/month	96.9211	85.7392	91.0973	80.0601	77.5982	69.9072	68.9545	71.6814	72.4613	80.8250	85.9823	95.8528 (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	26.7358	21.4485	19.3120	14.1488	10.9289	8.9290	9.9697	12.9590	16.8325	22.0851	24.9451	27.4789 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-13.0664	-22.4650	-39.7170	-52.8232	-63.1468	-61.0223	-59.7740	-52.7356	-41.1458	-28.1648	-15.4084	-10.7263 (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												511.8174 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												291.4090	
Water heating fuel used												977.0806 (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)												215.7734 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													

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PV generation	-460.1955	(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	1244.4758	(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	511.8174	0.1574	80.5638 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	977.0806	0.1409	137.6568 (264)
Space and water heating			218.2206 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	215.7734	0.1443	31.1428 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-460.1955	0.1314	-60.4792
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-60.4792 (269)
Total CO ₂ , kg/year			188.8841 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.1700 (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	511.8174	1.5827	810.0370 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	977.0806	1.5209	1486.0849 (278)
Space and water heating			2296.1219 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	215.7734	1.5338	330.9604 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-460.1955	1.4855	-683.6353
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-683.6353 (283)
Total Primary energy kWh/year			1943.4470 (286)
Dwelling Primary energy Rate (DPER)			22.3400 (287)

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

1. Overall dwelling characteristics

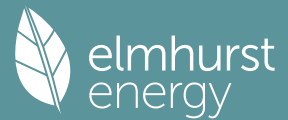
	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.0000 (1b)	x 2.6000 (2b)	= 226.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 226.2000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1326 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3826 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3826 (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	0.4878	0.4783	0.4687	0.4209	0.4113	0.3635	0.3635	0.3539	0.3826	0.4113	0.4305	0.4496 (22b)
Effective ac	0.6190	0.6144	0.6098	0.5886	0.5846	0.5661	0.5661	0.5626	0.5732	0.5846	0.5926	0.6011 (25)

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3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
TER Opaque door			2.3400	1.0000	2.3400			(26)
TER Opening Type (Uw = 1.20)			19.4200	1.1450	22.2366			(27)
EXTERNAL	86.2100	21.7600	64.4500	0.1800	11.6010			(29a)
External Roof 1	6.3100		6.3100	0.1100	0.6941			(30)
Total net area of external elements Aum(A, m ²)			92.5200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.8717			(33)
Party Wall 1			21.2700	0.0000	0.0000			(32)

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

168.7229 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	12.2600	0.0500	0.6130	
E2 Other lintels (including other steel lintels)	4.8000	0.0500	0.2400	
E3 Sill	27.9200	0.0500	1.3960	
E4 Jamb	58.6100	0.0700	4.1027	
E7 Party floor between dwellings (in blocks of flats)	10.4000	0.0900	0.9360	
E16 Corner (normal)	5.2000	0.0600	0.3120	
E18 Party wall between dwellings	16.3600	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	7.7100	0.0800	0.6168	
E14 Flat roof				8.2165 (36)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				0.0000
Point Thermal Bridges			(36a) =	
Total fabric heat loss			(33) + (36) + (36a) =	45.0882 (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	46.2057	45.8608	45.5227	43.9347	43.6376	42.2544	42.2544	41.9983	42.7872	43.6376	44.2386	44.8670	(38)
Heat transfer coeff	91.2940	90.9490	90.6109	89.0229	88.7258	87.3427	87.3427	87.0865	87.8754	88.7258	89.3269	89.9552	(39)
Average = Sum(39)m / 12 =												89.0215	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0494	1.0454	1.0415	1.0233	1.0198	1.0039	1.0039	1.0010	1.0101	1.0198	1.0267	1.0340	(40)
HLP (average)												1.0232	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

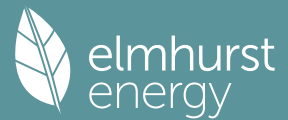
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5824 (42)
Hot water usage for mixer showers													
67.5179	66.5033	65.0247	62.1958	60.1080	57.7799	56.4565	57.9239	59.5324	62.0322	64.9219	67.2593	67.2593	(42a)
Hot water usage for baths													
29.1581	28.7251	28.1153	26.9909	26.1490	25.2154	24.7112	25.3167	25.9760	26.9750	28.1225	29.0596	29.0596	(42b)
Hot water usage for other uses													
41.0763	39.5826	38.0889	36.5952	35.1015	33.6079	33.6079	35.1015	36.5952	38.0889	39.5826	41.0763	41.0763	(42c)
Average daily hot water use (litres/day)													126.6255 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.7524	134.8110	131.2289	125.7819	121.3586	116.6032	114.7755	118.3421	122.1037	127.0961	132.6270	137.3951	(44)
Energy conte	218.1661	191.9690	201.6940	172.1891	163.3720	143.3772	138.8111	146.5323	150.5660	172.4682	188.9515	215.1275	(45)
Energy content (annual)										Total = Sum(45)m =		2103.2239	
Distribution loss (46)m = 0.15 x (45)m													
32.7249	28.7954	30.2541	25.8284	24.5058	21.5066	20.8217	21.9798	22.5849	25.8702	28.3427	32.2691	32.2691	(46)
Water storage loss:													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6525 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8924 (55)
Total storage loss													
27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	(56)
If cylinder contains dedicated solar storage													
27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	(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													
269.0921	237.9668	252.6200	221.4724	214.2980	192.6605	189.7371	197.4584	199.8493	223.3942	238.2348	266.0536	266.0536	(62)
WWHRS	-30.8664	-27.2985	-28.5854	-23.6698	-22.0594	-18.8764	-17.6936	-18.8154	-19.5303	-23.0240	-26.0834	-30.2948	(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													
238.2258	210.6683	224.0346	197.8026	192.2386	173.7841	172.0435	178.6430	180.3191	200.3702	212.1513	235.7588	235.7588	(64)
12Total per year (kWh/year)													2416.0398 (64)
Electric shower(s)													2416 (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													
113.2811	100.6279	107.8041	96.6795	95.0620	87.0995	86.8955	89.4628	89.4898	98.0865	102.2530	112.2708	112.2708	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
117.7455	130.3611	117.7455	121.6704	117.7455	121.6704	117.7455	117.7455	121.6704	117.7455	121.6704	117.7455	117.7455	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486	223.1486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	(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)													
-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	(71)
Water heating gains (Table 5)													
152.2595	149.7439	144.8980	134.2771	127.7716	120.9716	116.7951	120.2458	124.2914	131.8367	142.0181	150.9016	150.9016	(72)
Total internal gains													
568.1899	580.7124	557.1463	537.4544	510.6191	489.3257	470.9239	471.9521	486.0272	505.6435	536.1546	556.5316	556.5316	(73)

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6. Solar gains

[Jan]					Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North					3.4300	10.6334	0.6300		0.7000		0.7700	11.1465 (74)
East					7.9000	19.6403	0.6300		0.7000		0.7700	47.4183 (76)
South					7.5400	46.7521	0.6300		0.7000		0.7700	107.7318 (78)
West					0.5500	19.6403	0.6300		0.7000		0.7700	3.3013 (80)
Solar gains	169.5979	296.9567	424.3442	550.4632	635.0749	637.5518	611.8050	548.3096	468.3362	333.3913	204.6909	144.0918 (83)
Total gains	737.7878	877.6691	981.4905	1087.9176	1145.6940	1126.8775	1082.7289	1020.2617	954.3634	839.0348	740.8455	700.6234 (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	44.6631	44.8325	44.9997	45.8025	45.9559	46.6836	46.6836	46.8209	46.4006	45.9559	45.6466	45.3278
alpha	3.9775	3.9888	4.0000	4.0535	4.0637	4.1122	4.1122	4.1214	4.0934	4.0637	4.0431	4.0219
util living area	0.9704	0.9436	0.8973	0.7981	0.6547	0.4817	0.3517	0.3875	0.5952	0.8387	0.9460	0.9751 (86)
MIT	19.6251	19.9173	20.2621	20.6425	20.8714	20.9721	20.9939	20.9910	20.9342	20.6248	20.0752	19.5866 (87)
Th 2	20.0424	20.0457	20.0489	20.0640	20.0668	20.0801	20.0801	20.0825	20.0750	20.0668	20.0611	20.0551 (88)
util rest of house	0.9644	0.9328	0.8783	0.7643	0.6040	0.4174	0.2796	0.3125	0.5276	0.8030	0.9338	0.9700 (89)
MIT 2	18.4591	18.8253	19.2497	19.7074	19.9560	20.0619	20.0774	20.0784	20.0276	19.7014	19.0386	18.4197 (90)
Living area fraction									fLA = Living area / (4) =			0.3333 (91)
MIT	18.8478	19.1893	19.5871	20.0191	20.2611	20.3653	20.3829	20.3826	20.3298	20.0092	19.3842	18.8087 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8478	19.1893	19.5871	20.0191	20.2611	20.3653	20.3829	20.3826	20.3298	20.0092	19.3842	18.8087 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9547	0.9210	0.8678	0.7625	0.6149	0.4377	0.3036	0.3373	0.5469	0.8005	0.9230	0.9611 (94)
Useful gains	704.3510	808.3573	851.7058	829.5746	704.5415	493.2405	328.6660	344.1379	521.9480	671.6473	683.8144	673.4000 (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	1328.1246	1299.5982	1185.8378	989.8538	759.5945	503.5544	330.4128	346.8305	547.4457	834.8388	1097.3060	1314.1261 (97)
Space heating kWh	464.0875	330.1139	248.5942	115.4010	40.9594	0.0000	0.0000	0.0000	0.0000	121.4144	297.7139	476.7002 (98a)
Space heating requirement - total per year (kWh/year)												2094.9846
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	464.0875	330.1139	248.5942	115.4010	40.9594	0.0000	0.0000	0.0000	0.0000	121.4144	297.7139	476.7002 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2094.9846
Space heating per m ²										(98c) / (4) =		24.0803 (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	464.0875	330.1139	248.5942	115.4010	40.9594	0.0000	0.0000	0.0000	0.0000	121.4144	297.7139	476.7002 (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)	502.8034	357.6532	269.3328	125.0282	44.3764	0.0000	0.0000	0.0000	0.0000	131.5432	322.5503	516.4683 (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	238.2258	210.6683	224.0346	197.8026	192.2386	173.7841	172.0435	178.6430	180.3191	200.3702	212.1513	235.7588 (64)
Efficiency of water heater	85.5281	85.0627	84.2936	82.8956	81.2463	79.8000	79.8000	79.8000	79.8000	82.9730	84.8196	79.8000 (216)
Fuel for water heating, kWh/month	278.5352	247.6623	265.7789	238.6165	236.6121	217.7745	215.5934	223.8634	225.9637	241.4884	250.1206	85.6052 (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	24.4652	19.6269	17.6718	12.9471	10.0007	8.1707	9.1230	11.8584	15.4029	20.2095	22.8266	25.1452 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-16.3457	-24.6685	-37.9243	-45.6973	-51.9963	-49.5274	-48.9147	-44.8091	-38.0827	-29.5029	-18.5342	-13.9483 (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)	-4.8852	-10.5816	-21.6184	-33.3571	-44.9992	-45.5540	-45.0292	-37.7217	-27.1178	-15.4279	-6.6140	-3.8415 (233b)

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Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													2269.7558	(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													2917.4116	(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)													197.4482	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-716.6988	(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													4753.9168	(238)

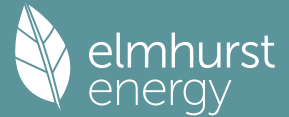
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2269.7558	0.2100	476.6487 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2917.4116	0.2100	612.6564 (264)
Space and water heating			1089.3052 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	197.4482	0.1443	28.4979 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-419.9513	0.1332	-55.9341
PV Unit electricity exported	-296.7476	0.1251	-37.1258
Total			-93.0599 (269)
Total CO2, kg/year			1036.6724 (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	2269.7558	1.1300	2564.8241 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2917.4116	1.1300	3296.6751 (278)
Space and water heating			5861.4992 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	197.4482	1.5338	302.8526 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-419.9513	1.4922	-626.6407
PV Unit electricity exported	-296.7476	0.4592	-136.2658
Total			-762.9065 (283)
Total Primary energy kWh/year			5531.5461 (286)
Target Primary Energy Rate (TPER)			63.5800 (287)

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Property Reference	13 Bedford Road_Copy				Issued on Date	27/02/2024
Assessment Reference	Flat 5 - Heatpump+PV_Copy		Prop Type Ref	13 Bedford Road		
Property	Flat 1, 13 Bedford Road, LONDON, N22 7AU					
SAP Rating	91 B	DER	2.45	TER	13.24	
Environmental	98 A	% DER < TER				81.50
CO ₂ Emissions (t/year)	0.13	DFEE	24.29	TFEE	29.08	
Compliance Check	See BREL	% DFEE < TFEE				16.47
% DPER < TPER	64.19	DPER	25.44	TPER	71.05	
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	61.0000 (1b)	2.6000 (2b)	158.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0000		158.6000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	158.6000 (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) =	0.1261	(8)
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	3.0000		(17)
Infiltration rate	0.2761		(18)
Number of sides sheltered	0		(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2761	(21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3520	0.3451	0.3382	0.3037	0.2968	0.2623	0.2623	0.2554	0.2761	0.2968	0.3106	0.3244 (22b)
Effective ac	0.5620	0.5596	0.5572	0.5461	0.5440	0.5344	0.5344	0.5326	0.5381	0.5440	0.5482	0.5526 (25)

3. Heat losses and heat loss parameter

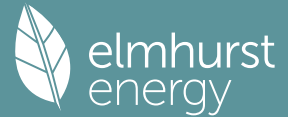
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
ENTRANCE DOOR			2.3400	0.8000	1.8720		(26)
WINDOWS (Uw = 0.80)			15.6000	0.7752	12.0930		(27)
EXTERNAL	56.1300	17.9400	38.1900	0.1500	5.7285	70.0000	2673.3000 (29a)
Total net area of external elements Aum(A, m ²)			56.1300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	19.6935			(33)
Party Wall 1			32.7900	0.0000	0.0000	180.0000	5902.2000 (32)
Party Floor 1			61.0000			40.0000	2440.0000 (32d)
Party Ceiling 1			61.0000			30.0000	1830.0000 (32b)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28)...(30) + (32) + (32a)...(32e) = 12845.5000 (34)
210.5820 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.2000	0.3000	2.4600
E3 Sill	4.0300	0.0400	0.1612
E4 Jamb	26.6600	0.0500	1.3330
E7 Party floor between dwellings (in blocks of flats)	43.1800	0.0700	3.0226
E16 Corner (normal)	7.8000	0.0900	0.7020
E17 Corner (inverted - internal area greater than external area)	5.2000	-0.0900	-0.4680
E18 Party wall between dwellings	10.4000	0.0600	0.6240

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P3 Party wall - Intermediate floor between dwellings (in blocks of flats) 29.2200 0.0000 0.0000
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.8348 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 27.5283 (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 29.4120 29.2861 29.1627 28.5829 28.4744 27.9694 27.9694 27.8759 28.1639 28.4744 28.6939 28.9233 (38)
 Average = Sum(39)m / 12 = 56.9404 56.8144 56.6910 56.1112 56.0027 55.4978 55.4978 55.4042 55.6923 56.0027 56.2222 56.4516 (39)
 56.1107 56.1107

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 HLP (average) 0.9334 0.9314 0.9294 0.9199 0.9181 0.9098 0.9098 0.9083 0.9130 0.9181 0.9217 0.9254 (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 2.0098 (42)
 Hot water usage for mixer showers 57.9167 57.0463 55.7780 53.3513 51.5605 49.5634 48.4282 49.6869 51.0667 53.2110 55.6898 57.6948 (42a)
 Hot water usage for baths 26.3466 25.9553 25.4043 24.3884 23.6276 22.7841 22.3284 22.8756 23.4714 24.3740 25.4109 26.2576 (42b)
 Hot water usage for other uses 37.0652 35.7174 34.3696 33.0218 31.6739 30.3261 30.3261 31.6739 33.0218 34.3696 35.7174 37.0652 (42c)
 Average daily hot water use (litres/day) 111.5204 (43)
 Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 Energy conte 121.3286 118.7191 115.5519 110.7615 106.8621 102.6736 101.0828 104.2365 107.5598 111.9546 116.8181 121.0176 (44)
 Energy content (annual) 192.1548 169.0544 177.5990 151.6269 143.8569 126.2492 122.2509 129.0665 132.6320 151.9213 166.4288 189.4843 (45)
 Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1852.3250
 28.8232 25.3582 26.6399 22.7440 21.5785 18.9374 18.3376 19.3600 19.8948 22.7882 24.9643 28.4226 (46)
 Water storage loss:
 Store volume 200.0000 (47)
 a) If manufacturer declared loss factor is known (kWh/day): 2.1000 (48)
 Temperature factor from Table 2b 0.5400 (49)
 Enter (49) or (54) in (55) 1.1340 (55)
 Total storage loss
 35.1540 31.7520 35.1540 34.0200 35.1540 34.0200 35.1540 35.1540 34.0200 35.1540 34.0200 35.1540 (56)
 If cylinder contains dedicated solar storage
 35.1540 31.7520 35.1540 34.0200 35.1540 34.0200 35.1540 35.1540 34.0200 35.1540 34.0200 35.1540 (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
 250.5712 221.8176 236.0154 208.1589 202.2733 182.7812 180.6673 187.4829 189.1640 210.3377 222.9608 247.9007 (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
 250.5712 221.8176 236.0154 208.1589 202.2733 182.7812 180.6673 187.4829 189.1640 210.3377 222.9608 247.9007 (64)
 Total per year (kWh/year) = Sum(64)m = 2540.1310 (64)
 2540 (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
 110.6246 98.4211 105.7848 95.6415 94.5655 87.2034 87.3815 89.6477 89.3258 97.2470 100.5632 109.7367 (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 88.4945 97.9760 88.4945 91.4443 88.4945 91.4443 88.4945 88.4945 91.4443 88.4945 91.4443 88.4945 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 175.4617 177.2825 172.6943 162.9265 150.5964 139.0079 131.2661 129.4454 134.0336 143.8013 156.1314 167.7199 (68)
 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 33.0488 (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) -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 -80.3905 (71)
 Water heating gains (Table 5) 148.6890 146.4600 142.1839 132.8355 127.1042 121.1159 117.4483 120.4943 124.0635 130.7083 139.6711 147.4955 (72)
 Total internal gains 465.7916 474.8650 456.5190 440.3527 419.3416 404.7146 390.3553 391.5805 402.6878 416.1505 440.3932 456.8563 (73)

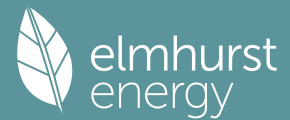
6. Solar gains

[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 2.5600 10.6334 0.5700 0.7700 7.5269 (74)
 East 8.5100 19.6403 0.5700 0.7700 46.2150 (76)
 South 4.5300 46.7521 0.5700 0.7700 58.5605 (78)
 Solar gains 112.3025 200.6978 295.4975 394.4799 462.8885 467.5045 447.5054 396.1058 330.1684 227.8422 136.3243 94.8815 (83)
 Total gains 578.0941 675.5628 752.0166 834.8326 882.2301 872.2191 837.8607 787.6863 732.8562 643.9928 576.7175 551.7378 (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	62.6655	62.8044	62.9411	63.5915	63.7147	64.2944	64.2944	64.4029	64.0698	63.7147	63.4660	63.2080
alpha	5.1777	5.1870	5.1961	5.2394	5.2476	5.2863	5.2863	5.2935	5.2713	5.2476	5.2311	5.2139
util living area	0.9688	0.9359	0.8735	0.7423	0.5745	0.4051	0.2911	0.3230	0.5159	0.7950	0.9371	0.9743 (86)
Living	20.6150	20.6722	20.7342	20.7913	20.8155	20.8231	20.8239	20.8241	20.8203	20.7856	20.6952	20.6054
Non living	19.6754	19.7472	19.8225	19.8938	19.9190	19.9329	19.9334	19.9350	19.9280	19.8910	19.7844	19.6699
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	20.8031	20.6722	20.7342	20.7913	20.8155	20.8231	20.8239	20.8241	20.8203	20.7856	20.6952	20.6606 (87)
Th 2	20.1392	20.1409	20.1426	20.1507	20.1522	20.1592	20.1592	20.1605	20.1565	20.1522	20.1491	20.1459 (88)
util rest of house	0.9616	0.9227	0.8501	0.7045	0.5269	0.3528	0.2357	0.2643	0.4561	0.7532	0.9218	0.9683 (89)
MIT 2	19.9543	19.7472	19.8225	19.8938	19.9190	19.9329	19.9334	19.9350	19.9280	19.8910	19.7844	19.7557 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.3021	20.1263	20.1961	20.2616	20.2864	20.2977	20.2984	20.2994	20.2937	20.2577	20.1577	20.1265 (91)
Temperature adjustment												0.0000
adjusted MIT	20.3021	20.1263	20.1961	20.2616	20.2864	20.2977	20.2984	20.2994	20.2937	20.2577	20.1577	20.1265 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9631	0.9225	0.8517	0.7097	0.5346	0.3615	0.2449	0.2741	0.4659	0.7588	0.9220	0.9682 (94)
Useful gains	556.7748	623.1751	640.4984	592.4527	471.5978	315.2659	205.1603	215.8745	341.4738	488.6497	531.7250	534.1818 (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	911.1677	865.0758	776.4480	637.5131	480.8622	316.2117	205.2517	216.0410	344.9425	540.8566	734.1328	899.0785 (97)
Space heating kWh	263.6684	162.5573	101.1465	32.4435	6.8927	0.0000	0.0000	0.0000	0.0000	38.8419	145.7336	271.4832 (98a)
Space heating requirement - total per year (kWh/year)												1022.7670
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	263.6684	162.5573	101.1465	32.4435	6.8927	0.0000	0.0000	0.0000	0.0000	38.8419	145.7336	271.4832 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1022.7670
Space heating per m2										(98c) / (4) =		16.7667 (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 %)												323.1386 (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	263.6684	162.5573	101.1465	32.4435	6.8927	0.0000	0.0000	0.0000	0.0000	38.8419	145.7336	271.4832 (98)
Space heating efficiency (main heating system 1)	323.1386	323.1386	323.1386	323.1386	323.1386	0.0000	0.0000	0.0000	0.0000	323.1386	323.1386	323.1386 (210)
Space heating fuel (main heating system)	81.5961	50.3057	31.3013	10.0401	2.1330	0.0000	0.0000	0.0000	0.0000	12.0202	45.0994	84.0145 (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	250.5712	221.8176	236.0154	208.1589	202.2733	182.7812	180.6673	187.4829	189.1640	210.3377	222.9608	247.9007 (64)
Efficiency of water heater	292.6535	292.6535	292.6535	292.6535	292.6535	292.6535	292.6535	292.6535	292.6535	292.6535	292.6535	292.6535 (216)
Fuel for water heating, kWh/month	85.6204	75.7953	80.6467	71.1281	69.1170	62.4565	61.7342	64.0631	64.6375	71.8726	76.1859	84.7079 (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	17.9560	14.4049	12.9701	9.5024	7.3399	5.9968	6.6957	8.7034	11.3048	14.8325	16.7533	18.4550 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-9.2016	-15.8900	-28.2509	-37.8780	-45.6995	-44.4233	-43.5166	-38.2454	-29.6461	-20.0330	-10.8754	-7.5490 (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												316.5103 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												292.6535
Water heating fuel used												867.9653 (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)												144.9149 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-331.2088 (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	998.1817 (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	316.5103	0.1580	49.9946 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	867.9653	0.1408	122.2113 (264)
Space and water heating			172.2059 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	144.9149	0.1443	20.9157 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-331.2088	0.1313	-43.4721
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-43.4721 (269)
Total CO2, kg/year			149.6495 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.4500 (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	316.5103	1.5847	501.5700 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	867.9653	1.5206	1319.8544 (278)
Space and water heating			1821.4244 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	144.9149	1.5338	222.2753 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-331.2088	1.4849	-491.8121
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-491.8121 (283)
Total Primary energy kWh/year			1551.8876 (286)
Dwelling Primary energy Rate (DPER)			25.4400 (287)

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

1. Overall dwelling characteristics

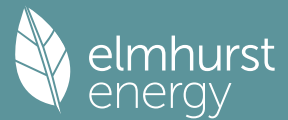
	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.0000 (1b)	x 2.6000 (2b)	= 158.6000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.6000 (5)

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) = 0.1261 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3761 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3761 (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	0.4795	0.4701	0.4607	0.4137	0.4043	0.3573	0.3573	0.3479	0.3761	0.4043	0.4231	0.4419 (22b)
Effective ac	0.6150	0.6105	0.6061	0.5856	0.5817	0.5638	0.5638	0.5605	0.5707	0.5817	0.5895	0.5976 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.3400	1.0000	2.3400			(26)
TER Opening Type (Uw = 1.20)			12.9100	1.1450	14.7824			(27)
EXTERNAL	56.1300	15.2500	40.8800	0.1800	7.3584			(29a)
Total net area of external elements Aum(A, m2)			56.1300					(31)
Fabric heat loss, W/K = Sum (A x U)								(33)
Party Wall 1			32.7900	0.0000	0.0000			(32)

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

220.5820 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	8.2000	0.0500	0.4100	
E2 Other lintels (including other steel lintels)	4.0300	0.0500	0.2015	
E3 Sill	26.6600	0.0500	1.3330	
E4 Jamb	43.1800	0.0700	3.0226	
E7 Party floor between dwellings (in blocks of flats)	7.8000	0.0900	0.7020	
E16 Corner (normal)	5.2000	-0.0900	-0.4680	
E17 Corner (inverted - internal area greater than external area)	10.4000	0.0600	0.6240	
E18 Party wall between dwellings	29.2200	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				

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

5.8251 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 30.3059 (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	32.1866	31.9529	31.7239	30.6481	30.4468	29.5098	29.5098	29.3363	29.8707	30.4468	30.8540	31.2797	(38)
Average = Sum(39)m / 12 =	62.4925	62.2589	62.0298	60.9540	60.7527	59.8157	59.8157	59.6422	60.1766	60.7527	61.1599	61.5856	(39)
													60.9530

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0245	1.0206	1.0169	0.9992	0.9959	0.9806	0.9806	0.9777	0.9865	0.9959	1.0026	1.0096	(40)
HLP (average)													0.9992
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

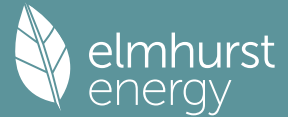
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0098 (42)
Hot water usage for mixer showers	57.9167	57.0463	55.7780	53.3513	51.5605	49.5634	48.4282	49.6869	51.0667	53.2110	55.6898	57.6948	(42a)
Hot water usage for baths	25.0293	24.6576	24.1341	23.1690	22.4462	21.6449	21.2120	21.7318	22.2978	23.1553	24.1403	24.9447	(42b)
Hot water usage for other uses	35.2120	33.9315	32.6511	31.3707	30.0902	28.8098	28.8098	30.0902	31.3707	32.6511	33.9315	35.2120	(42c)
Average daily hot water use (litres/day)													108.6142 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	118.1580	115.6354	112.5632	107.8910	104.0970	100.0181	98.4501	101.5090	104.7352	109.0174	113.7617	117.8515	(44)
Energy content (annual)	187.1333	164.6633	173.0055	147.6973	140.1346	122.9839	119.0668	125.6893	129.1490	147.9356	162.0744	184.5269	(45)
Distribution loss (46)m = 0.15 x (45)m	28.0700	24.6995	25.9508	22.1546	21.0202	18.4476	17.8600	18.8534	19.3723	22.1903	24.3112	27.6790	(46)
Water storage loss:													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6525 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8924 (55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(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	238.0594	210.6611	223.9316	196.9806	191.0606	172.2672	169.9929	176.6154	178.4322	198.8617	211.3577	235.4530	(62)
WWHRS	-26.4771	-23.4166	-24.5205	-20.3039	-18.9225	-16.1921	-15.1775	-16.1398	-16.7530	-19.7500	-22.3743	-25.9868	(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	211.5823	187.2445	199.4111	176.6767	172.1381	156.0751	154.8153	160.4756	161.6792	179.1117	188.9834	209.4662	(64)
12Total per year (kWh/year)													2157.6593 (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	102.9627	91.5488	98.2652	88.5360	87.3356	80.3188	80.3306	82.5326	82.3687	89.9294	93.3164	102.0961	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	100.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	88.6967	98.1999	88.6967	91.6532	88.6967	91.6532	88.6967	88.6967	91.6532	88.6967	91.6532	88.6967	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.4617	177.2825	172.6943	162.9265	150.5964	139.0079	131.2661	129.4454	134.0336	143.8013	156.1314	167.7199	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	33.0488	(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)	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	-80.3905	(71)
Water heating gains (Table 5)	138.3907	136.2333	132.0769	122.9667	117.3866	111.5539	107.9712	110.9309	114.4009	120.8729	129.6061	137.2259	(72)
Total internal gains	458.6956	467.8621	449.6143	433.6928	412.8261	395.3615	381.0804	382.2194	393.2342	409.5174	433.5371	449.7889	(73)

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF or Table 6c	Access factor Table 6d	Gains W	
North	2.1200				10.6334		0.6300		0.7000	0.7700	6.8894	(74)
East	7.0400				19.6403		0.6300		0.7000	0.7700	42.2563	(76)
South	3.7500				46.7521		0.6300		0.7000	0.7700	53.5801	(78)
Solar gains	102.7258	183.5788	270.2838	360.8115	423.3769	427.5977	409.3061	362.2965	301.9929	208.4053	124.6983	86.7910 (83)
Total gains	561.4214	651.4408	719.8981	794.5043	836.2030	822.9592	790.3865	744.5158	695.2271	617.9227	558.2355	536.5800 (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	59.8094	60.0339	60.2555	61.3190	61.5222	62.4859	62.4859	62.6677	62.1111	61.5222	61.1126	60.6901
util living area	4.9873	5.0023	5.0170	5.0879	5.1015	5.1657	5.1657	5.1778	5.1407	5.1015	5.0742	5.0460
	0.9785	0.9561	0.9115	0.8032	0.6430	0.4604	0.3322	0.3672	0.5795	0.8453	0.9559	0.9821 (86)
MIT	20.0175	20.2451	20.5158	20.8013	20.9454	20.9920	20.9988	20.9980	20.9753	20.7810	20.3681	19.9879 (87)
Th 2	20.0630	20.0662	20.0693	20.0840	20.0867	20.0995	20.0995	20.1019	20.0946	20.0867	20.0811	20.0753 (88)
util rest of house	0.9730	0.9457	0.8916	0.7658	0.5893	0.3976	0.2646	0.2962	0.5102	0.8057	0.9437	0.9775 (89)
MIT 2	18.9438	19.2286	19.5589	19.8962	20.0438	20.0951	20.0991	20.1012	20.0790	19.8853	19.3967	18.9160 (90)
Living area fraction										fLA = Living area /	(4) =	0.4098 (91)
MIT	19.3839	19.6452	19.9510	20.2671	20.4133	20.4627	20.4678	20.4687	20.4463	20.2524	19.7948	19.3553 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3839	19.6452	19.9510	20.2671	20.4133	20.4627	20.4678	20.4687	20.4463	20.2524	19.7948	19.3553 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9681	0.9402	0.8888	0.7737	0.6090	0.4231	0.2924	0.3253	0.5376	0.8135	0.9391	0.9730 (94)
Useful gains	543.4875	612.4549	639.8499	614.7442	509.2709	348.2133	231.0710	242.1751	373.7837	502.6594	524.2403	522.1061 (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	942.6290	918.0173	834.3648	692.8727	529.3591	350.6808	231.3580	242.6686	381.9014	586.4094	776.4140	933.3471 (97)
Space heating kWh	296.9613	205.3379	144.7191	56.2525	14.9456	0.0000	0.0000	0.0000	0.0000	62.3100	181.5651	305.9633 (98a)
Space heating requirement - total per year (kWh/year)												1268.0548
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	296.9613	205.3379	144.7191	56.2525	14.9456	0.0000	0.0000	0.0000	0.0000	62.3100	181.5651	305.9633 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1268.0548
Space heating per m2										(98c) / (4) =		20.7878 (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	296.9613	205.3379	144.7191	56.2525	14.9456	0.0000	0.0000	0.0000	0.0000	62.3100	181.5651	305.9633	(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)	321.7349	222.4680	156.7921	60.9453	16.1924	0.0000	0.0000	0.0000	0.0000	67.5081	196.7119	331.4879	(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	211.5823	187.2445	199.4111	176.6767	172.1381	156.0751	154.8153	160.4756	161.6792	179.1117	188.9834	209.4662	(64)
Efficiency of water heater	84.8199	84.2671	83.3526	81.8022	80.4514	79.8000	79.8000	79.8000	79.8000	81.9435	83.9701	79.8000	(216)
Fuel for water heating, kWh/month	249.4488	222.2036	239.2379	215.9803	213.9654	195.5828	194.0042	201.0973	202.6056	218.5795	225.0604	246.6968	(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	18.4294	14.7848	13.3120	9.7530	7.5335	6.1549	6.8723	8.9329	11.6029	15.2236	17.1951	18.9416	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-11.5970	-17.5776	-27.1425	-32.8629	-37.5447	-35.8322	-35.4038	-32.3664	-27.4013	-21.1006	-13.1800	-9.8888	(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)	-3.2890	-7.1381	-14.6058	-22.5661	-30.4636	-30.8340	-30.4649	-25.5000	-18.3139	-10.4026	-4.4526	-2.5844	(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)

elmhurst
energy

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	1373.8405	1.1300	1552.4397 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	2624.4625	1.1300	2965.6426 (278)
Space and water heating			4518.0824 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	148.7360	1.5338	228.1362 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-301.8979	1.4918	-450.3715
PV Unit electricity exported	-200.6150	0.4591	-92.1033
Total			-542.4748 (283)
Total Primary energy kWh/year			4333.8446 (286)
Target Primary Energy Rate (TPER)			71.0500 (287)

Project name

Shop 1, 13 Bedford Road**As designed****Date:** Fri Jun 23 14:30:27 2023

Administrative information

Building Details

Address: 13 Bedford Road, Wood Green, LONDON, N22 7AU

Certifier details

Name: Mark Simons**Telephone number:** 020 8930 5668**Address:** 17 Dobree Avenue, London, NW10 2AD

Certification tool

Calculation engine: SBEM**Calculation engine version:** v6.1.c.0**Interface to calculation engine:** Lifespan SBEM**Interface to calculation engine version:** v6.1.c.0**BRUKL compliance module version:** v6.1.c.0**Foundation area [m²]:** 139.02The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	4.85
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	1.77
Target primary energy rate (TPER), kWh/m ² annum	52.43
Building primary energy rate (BPER), kWh/m ² annum	17.87
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.15	0.15	GF/01 SHOP/East/Wall-External
Floors	0.18	0.13	0.15	GF/02 TOILETS/Floor-External
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.11	0.11	GF/01 SHOP/Roof
Windows** and roof windows	1.6	0.8	0.8	GF/01 SHOP/East/Wall-External/Glazing
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	8

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Air Con

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	6.5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- Instantaneous

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
GF/02 TOILETS	0.3	-	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
GF/01 SHOP	233	50	3
GF/02 TOILETS	601	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF/01 SHOP	YES (+13.4%)	NO
GF/02 TOILETS	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	139	139
External area [m ²]	343.6	343.6
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	8	3
Average conductance [W/K]	66.08	123.88
Average U-value [W/m ² K]	0.19	0.36
Alpha value* [%]	35.72	20.88

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

100	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	5.38	10.5
Cooling	12.26	8.44
Auxiliary	0.32	0.43
Lighting	16.13	14.36
Hot water	1.65	1.65
Equipment*	20.24	20.24
TOTAL **	35.75	35.39

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	24.5	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>24.5</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	266.87	233.52
Primary energy [kWh/m ²]	17.87	52.43
Total emissions [kg/m ²]	1.77	4.85

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	63.1	203.8	5.4	12.3	0.3	3.26	4.62	3.5	6.5
	Notional	99.8	133.7	10.5	8.4	0.4	2.64	4.4	----	----

Key to terms	
Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Project name

Shop 2, 13 Bedford Road**As designed****Date:** Fri Jun 23 14:33:45 2023

Administrative information

Building Details

Address: 13 Bedford Road, Wood Green, LONDON, N22 7AU

Certifier details

Name: Mark Simons**Telephone number:** 020 8930 5668**Address:** 17 Dobree Avenue, London, NW10 2AD

Certification tool

Calculation engine: SBEM**Calculation engine version:** v6.1.c.0**Interface to calculation engine:** Lifespan SBEM**Interface to calculation engine version:** v6.1.c.0**BRUKL compliance module version:** v6.1.c.0**Foundation area [m²]:** 119.35The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	5.3
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	1.33
Target primary energy rate (TPER), kWh/m ² annum	56.91
Building primary energy rate (BPER), kWh/m ² annum	12.55
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.15	0.15	GF/01 SHOP/East/Wall-External
Floors	0.18	0.13	0.15	GF/02 TOILETS/Floor-External
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.11	0.11	GF/01 SHOP/Roof
Windows** and roof windows	1.6	0.8	0.8	GF/01 SHOP/East/Wall-External/Glazing
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	8

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Air Con

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	6.5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- Instantaneous

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
GF/02 TOILETS	0.3	-	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
GF/01 SHOP	233	50	3
GF/02 TOILETS	599	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF/01 SHOP	YES (+34%)	NO
GF/02 TOILETS	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	119.4	119.4
External area [m ²]	353.3	353.3
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	8	3
Average conductance [W/K]	62.13	103.91
Average U-value [W/m ² K]	0.18	0.29
Alpha value* [%]	27.83	17.92

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

100	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	6.62	12.78
Cooling	11.32	6.79
Auxiliary	0.38	0.5
Lighting	16.12	16.56
Hot water	1.65	1.65
Equipment*	20.23	20.23
TOTAL **	36.09	38.28

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	28.54	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>28.54</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	265.79	229.07
Primary energy [kWh/m ²]	12.55	56.91
Total emissions [kg/m ²]	1.33	5.3

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	77.7	188	6.6	11.3	0.4	3.26	4.62	3.5	6.5
	Notional	121.5	107.6	12.8	6.8	0.5	2.64	4.4	----	----

Key to terms	
Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

2. Full Overheating Calculations

ASSESSMENT CRITERIA - CIBSE TM52 (COMMERCIAL)

- **Criterion 1:** The first criterion sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by 1 K or more during the occupied hours of a typical non-heating season (1 May to 30 September).
- **Criterion 2:** The second criterion deals with the severity of overheating within any one day, which can be as important as its frequency, the level of which is a function of both temperature rise and its duration. This criterion sets a daily limit for acceptability.
- **Criterion 3:** The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable.

Building Category

- Category II - all units: Normal expectation

Block	Zone	Criterion 1 (%)	Criterion 2 (K.hr)	Criterion 3 (hr)	Pass/Fail
Ground Floor	Shop 1	0.65	4.50	0.00	Pass
	WC	0.50	1.00	0.00	Pass
Ground Floor	Shop 2	0.71	4.50	0.00	Pass
	WC	0.50	1.00	0.00	Pass
Ground Floor	Corridor	0.00	0.00	0.00	Pass

ASSESSMENT CRITERIA - CIBSE TM59 & TM49

CIBSE TM59:2017 (Design methodology for the assessment of overheating risk in homes) defines overheating criteria for residential buildings. The buildings will be predominantly naturally ventilated and hence the relevant TM59 criteria will be used for the assessment.

Naturally Ventilated Buildings: The criteria below can be applied to homes which are naturally ventilated building. The compliance is based on passing both of the following two criteria.

- Living rooms, Kitchens and Bedrooms:** The number of hours (h) during which Δ is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours. Please refer to CIBSE TM59.
- Bedrooms only:** The operative temperature in the bedroom between 10:00pm to 7:00am shall not exceed 26°C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26°C will be recorded as a fail).

CIBSE TM49:2014 - In line with guidance from the Greater London Authority, 3 weather files from the CIBSE TM49 document have been used

Weather File & Description

- London_GTW_DSY1 - London Gatwick Weather data: 2020 Moderately warm summer
- London_GTW_DSY2 - London Gatwick Weather data: 2050 featuring short intense warm spell
- London_GTW_DSY3 - London Gatwick Weather data: 2080 featuring long, less intense warm spell

Building Category

- Category II - all units: Normal expectation

Window Openings

- Glazed doors are modelled as 100% openable.

Lighting Gain

The internal gains from the lighting are based on CIBSE TM59 5.2

Small Power Gains

The house is modelled to include small power gains that are representative of typical equipment use in an everyday occurrence. There are associated with an assumed usage profile to represent which times of the day such appliances would result in a heat gain into the space. Small power gains include appliances such as TV's, fridge/freezers, toasters, kettles, hairdryers etc.

A list of anticipated heat gains in the dwellings are:

- Kitchen and Living spaces: 250W maximum power consumption
- Bedroom spaces: 150W maximum power consumption

The table below demonstrate a sample that has been assessed on by CIBSE TM59 Criteria using weather file Gatwick DSY 1:

Table 01: Summary of Results for Dining/living rooms and kitchens

Flat Num.	Room Name	Criteria A (During The Period May to September)	TM59 Criteria met ?
Dining/Living Room, kitchen and bedrooms			
First Floor			
Flat 1	Kitchen/Living	0.30	Pass
	Bedroom 1	0.15	Pass
	Bedroom 2	0.18	Pass
Flat 2	Kitchen/Living	0.60	Pass
	Bedroom 1	0.19	Pass
Flat 3	Kitchen/Living	0.60	Pass
Flat 4	Kitchen/Living	0.20	Pass
	Bedroom 1	0.20	Pass
	Bedroom 2	0.28	Pass
	Bedroom 3	0.25	Pass
Second Floor			
Flat 5	Kitchen/Living	0.43	Pass
	Bedroom 1	0.19	Pass
	Bedroom 2	0.22	Pass

Flat 6	Kitchen/Living	0.68	Pass
	Bedroom 1	0.24	Pass
Flat 3	Bedroom 1	0.28	Pass
	Bedroom 2	0.29	Pass
Flat 7	Kitchen/Living	0.40	Pass
	Bedroom 1	0.28	Pass
	Bedroom 2	0.35	Pass
	Bedroom 3	0.32	Pass
Third Floor			
Flat 8	Kitchen/Living	0.55	Pass
	Bedroom 1	0.26	Pass
	Bedroom 2	0.29	Pass
Flat 9	Kitchen/Living	0.85	Pass
	Bedroom 1	0.30	Pass
Flat 10	Flat 11 -Kitchen/Living	0.48	Pass
	Bedroom 1	0.36	Pass
	Bedroom 2	0.41	Pass
	Bedroom 3	0.39	Pass
Fourth Floor			
Flat 11	Kitchen/Living	0.75	Pass
	Bedroom 1	0.34	Pass
	Bedroom 2	0.37	Pass
Flat 12	Kitchen/Living	0.85	Pass
	Bedroom 1	0.40	Pass
	Bedroom 2	0.37	Pass

The table below demonstrate a sample that has been assessed on by CIBSE TM59 Criteria using weather file Gatwick DSY 2:

Table 02: Summary of Results for Dining/living rooms and kitchens

Flat Num.	Room Name	Criteria A (During The Period May to September)	TM59 Criteria met ?
Dining/Living Room, kitchen and bedrooms			
First Floor			
Flat 1	Kitchen/Living	0.45	Pass
	Bedroom 1	0.19	Pass
	Bedroom 2	0.22	Pass
Flat 2	Kitchen/Living	0.80	Pass
	Bedroom 1	0.23	Pass
Flat 3	Kitchen/Living	0.80	Pass
Flat 4	Kitchen/Living	0.45	Pass
	Bedroom 1	0.24	Pass
	Bedroom 2	0.32	Pass
	Bedroom 3	0.29	Pass

Second Floor			
Flat 5	Kitchen/Living	0.50	Pass
	Bedroom 1	0.23	Pass
	Bedroom 2	0.26	Pass
Flat 6	Kitchen/Living	0.85	Pass
	Bedroom 1	0.28	Pass
Flat 3	Bedroom 1	0.32	Pass
	Bedroom 2	0.33	Pass
Flat 7	Kitchen/Living	0.50	Pass
	Bedroom 1	0.32	Pass
	Bedroom 2	0.39	Pass
	Bedroom 3	0.36	Pass
Third Floor			
Flat 8	Kitchen/Living	0.72	Pass
	Bedroom 1	0.30	Pass
	Bedroom 2	0.33	Pass
Flat 9	Kitchen/Living	1.00	Pass
	Bedroom 1	0.34	Pass
Flat 10	Kitchen/Living	0.67	Pass
	Bedroom 1	0.40	Pass
	Bedroom 2	0.45	Pass
	Bedroom 3	0.43	Pass
Fourth Floor			
Flat 11	Kitchen/Living	1.10	Pass
	Bedroom 1	0.38	Pass
	Bedroom 2	0.41	Pass
Flat 12	Kitchen/Living	1.35	Pass
	Bedroom 1	0.44	Pass
	Bedroom 2	0.41	Pass

The table below demonstrate a sample that has been assessed on by CIBSE TM59 Criteria using weather file Gatwick DSY 3:

Table 03: Summary of Results for Dining/living rooms and kitchens

Flat Num.	Room Name	Criteria A (During The Period May to September)	TM59 Criteria met ?
Dining/Living Room, kitchen and bedrooms			
First Floor			
Flat 1	Kitchen/Living	0.62	Pass
	Bedroom 1	0.25	Pass
	Bedroom 2	0.28	Pass
Flat 2	Kitchen/Living	0.93	Pass
	Bedroom 1	0.29	Pass

Flat 3	Kitchen/Living	0.93	Pass
Flat 4	Kitchen/Living	0.62	Pass
	Bedroom 1	0.30	Pass
	Bedroom 2	0.38	Pass
	Bedroom 3	0.35	Pass
Second Floor			
Flat 5	Kitchen/Living	0.94	Pass
	Bedroom 1	0.29	Pass
	Bedroom 2	0.32	Pass
Flat 6	Kitchen/Living	1.00	Pass
	Bedroom 1	0.34	Pass
Flat 3	Bedroom 1	0.38	Pass
	Bedroom 2	0.39	Pass
Flat 7	Kitchen/Living	0.94	Pass
	Bedroom 1	0.38	Pass
	Bedroom 2	0.45	Pass
	Bedroom 3	0.42	Pass
Third Floor			
Flat 8	Kitchen/Living	1.05	Pass
	Bedroom 1	0.36	Pass
	Bedroom 2	0.39	Pass
Flat 9	Kitchen/Living	1.45	Pass
	Bedroom 1	0.40	Pass
Flat 10	Kitchen/Living	1.00	Pass
	Bedroom 1	0.46	Pass
	Bedroom 2	0.51	Pass
	Bedroom 3	0.49	Pass
Fourth Floor			
Flat 11	Kitchen/Living	1.52	Pass
	Bedroom 1	0.44	Pass
	Bedroom 2	0.47	Pass
Flat 12	Kitchen/Living	1.90	Pass
	Bedroom 1	0.50	Pass
	Bedroom 2	0.47	Pass

The table below demonstrate a sample that has been assessed on by CIBSE TM59 Criteria using weather file Gatwick DSY 1 for bedrooms:

Table 04: Summary of Results for Bedrooms - London_GTW_DSY1_

Flat Num.	Room Name	Criteria A (During The Period May to September)	TM59 Criteria met ?
Dining/Living Room, kitchen and bedrooms			

First Floor			
Flat 1	Bedroom 1	0.18	Pass
	Bedroom 2	0.12	Pass
Flat 2	Bedroom 1	0.15	Pass
Flat 4	Bedroom 1	0.17	Pass
	Bedroom 2	0.14	Pass
	Bedroom 3	0.18	Pass
Second Floor			
Flat 5	Bedroom 1	0.20	Pass
	Bedroom 2	0.13	Pass
Flat 6	Bedroom 1	0.18	Pass
Flat 3	Bedroom 1	0.18	Pass
	Bedroom 2	0.19	Pass
Flat 7	Bedroom 1	0.20	Pass
	Bedroom 2	0.17	Pass
	Bedroom 3	0.21	Pass
Third Floor			
Flat 8	Bedroom 1	0.24	Pass
	Bedroom 2	0.16	Pass
Flat 9	Bedroom 1	0.21	Pass
Flat 10	Bedroom 1	0.24	Pass
	Bedroom 2	0.19	Pass
	Bedroom 3	0.25	Pass
Fourth Floor			
Flat 11	Bedroom 1	0.27	Pass
	Bedroom 2	0.27	Pass
Flat 12	Bedroom 1	0.27	Pass
	Bedroom 2	0.20	Pass

The table below demonstrate a sample that has been assessed on by CIBSE TM59 Criteria using weather file Gatwick DSY 2 for bedrooms:

Table 05: Summary of Results for Bedrooms - London_GTW_DSY2_

Flat Num.	Room Name	Criteria A (During The Period May to September)	TM59 Criteria met ?
Dining/Living Room, kitchen and bedrooms			
First Floor			
Flat 1	Bedroom 1	0.22	Pass
	Bedroom 2	0.16	Pass
Flat 2	Bedroom 1	0.19	Pass
Flat 4	Bedroom 1	0.20	Pass
	Bedroom 2	0.18	Pass

	Bedroom 3	0.21	Pass
Second Floor			
Flat 5	Bedroom 1	0.24	Pass
	Bedroom 2	0.17	Pass
Flat 6	Bedroom 1	0.22	Pass
Flat 3	Bedroom 1	0.22	Pass
	Bedroom 2	0.23	Pass
Flat 7	Bedroom 1	0.24	Pass
	Bedroom 2	0.20	Pass
	Bedroom 3	0.25	Pass
Third Floor			
Flat 8	Bedroom 1	0.28	Pass
	Bedroom 2	0.21	Pass
Flat 9	Bedroom 1	0.27	Pass
Flat 10	Bedroom 1	0.29	Pass
	Bedroom 2	0.22	Pass
	Bedroom 3	0.30	Pass
Fourth Floor			
Flat 11	Bedroom 1	0.31	Pass
	Bedroom 2	0.30	Pass
Flat 12	Bedroom 1	0.31	Pass
	Bedroom 2	0.27	Pass

The table below demonstrate a sample that has been assessed on by CIBSE TM59 Criteria using weather file Gatwick DSY 3 for bedrooms:

Table 06: Summary of Results for Bedrooms - London_GTW_DSY3_

Flat Num.	Room Name	Criteria A (During The Period May to September)	TM59 Criteria met ?
Dining/Living Room, kitchen and bedrooms			
First Floor			
Flat 1	Bedroom 1	0.26	Pass
	Bedroom 2	0.20	Pass
Flat 2	Bedroom 1	0.24	Pass
Flat 4	Bedroom 1	0.26	Pass
	Bedroom 2	0.25	Pass
	Bedroom 3	0.27	Pass
Second Floor			
Flat 5	Bedroom 1	0.30	Pass
	Bedroom 2	0.25	Pass
Flat 6	Bedroom 1	0.29	Pass
Flat 3	Bedroom 1	0.30	Pass

	Bedroom 2	0.31	Pass
Flat 7	Bedroom 1	0.31	Pass
	Bedroom 2	0.27	Pass
	Bedroom 3	0.33	Pass
Third Floor			
Flat 8	Bedroom 1	0.38	Pass
	Bedroom 2	0.30	Pass
Flat 9	Bedroom 1	0.35	Pass
Flat 10	Bedroom 1	0.37	Pass
	Bedroom 2	0.33	Pass
	Bedroom 3	0.40	Pass
Fourth Floor			
Flat 11	Bedroom 1	0.45	Pass
	Bedroom 2	0.41	Pass
Flat 12	Bedroom 1	0.45	Pass
	Bedroom 2	0.41	Pass

CIBSE TM49: 2014 Compliance

DYS1 (2020) Weather Data Results

Room Name	Criteria 1 $\leq 3.0\%$	Criteria 2 $W_{e} \leq 6$	Criteria 3 $\Delta T \leq 4$	Compliance
% of spaces pass	100	100	100	Pass
% of spaces fail	0	0	0	

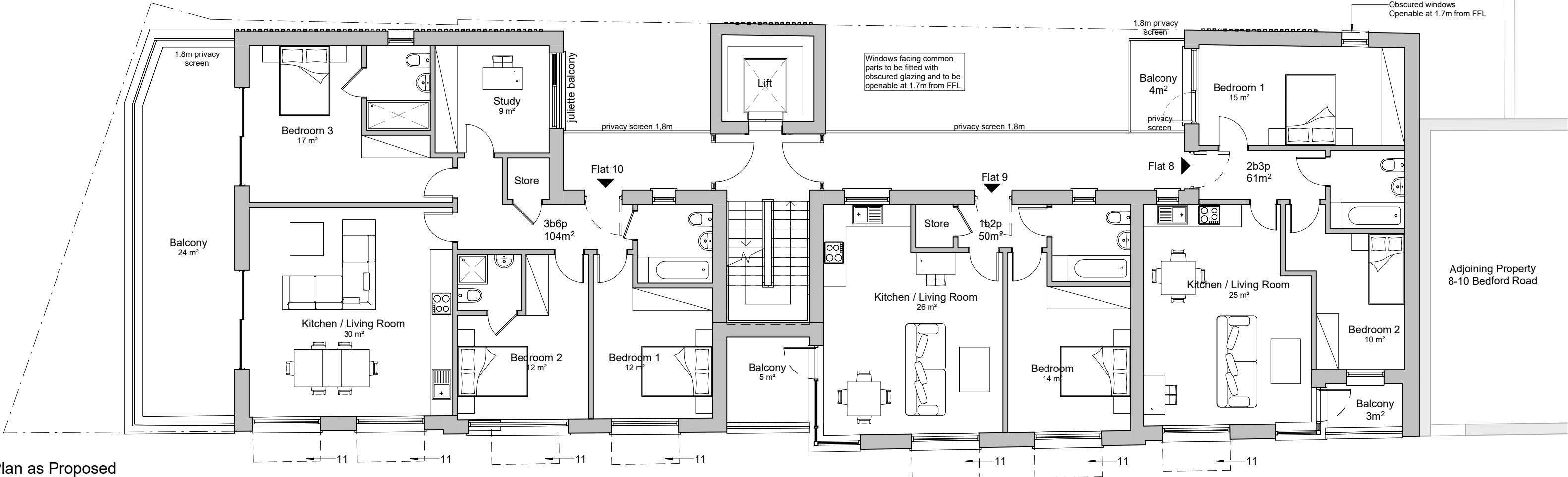
DYS2 (2050) Weather Data Results

Room Name	Criteria 1 $\leq 3.0\%$	Criteria 2 $W_{e} \leq 6$	Criteria 3 $\Delta T \leq 4$	Compliance
% of spaces pass	100	100	100	Pass
% of spaces fail	0	0	0	

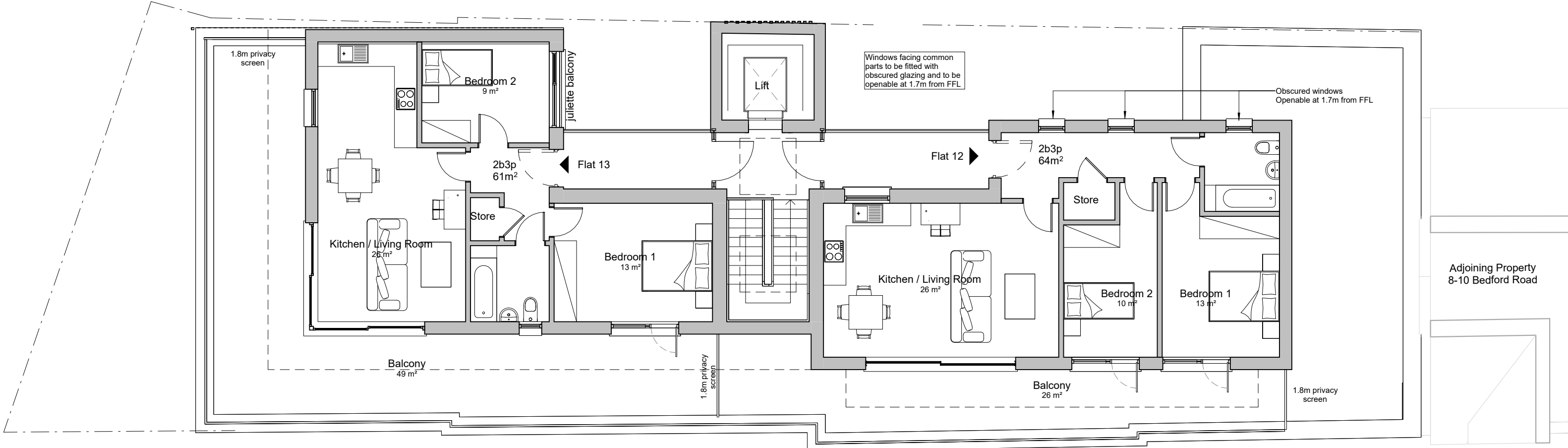
DYS2 (2080) Weather Data Results

Room Name	Criteria 1 $\leq 3.0\%$	Criteria 2 $W_{e} \leq 6$	Criteria 3 $\Delta T \leq 4$	Compliance
% of spaces pass	100	100	100	Pass
% of spaces fail	0	0	0	

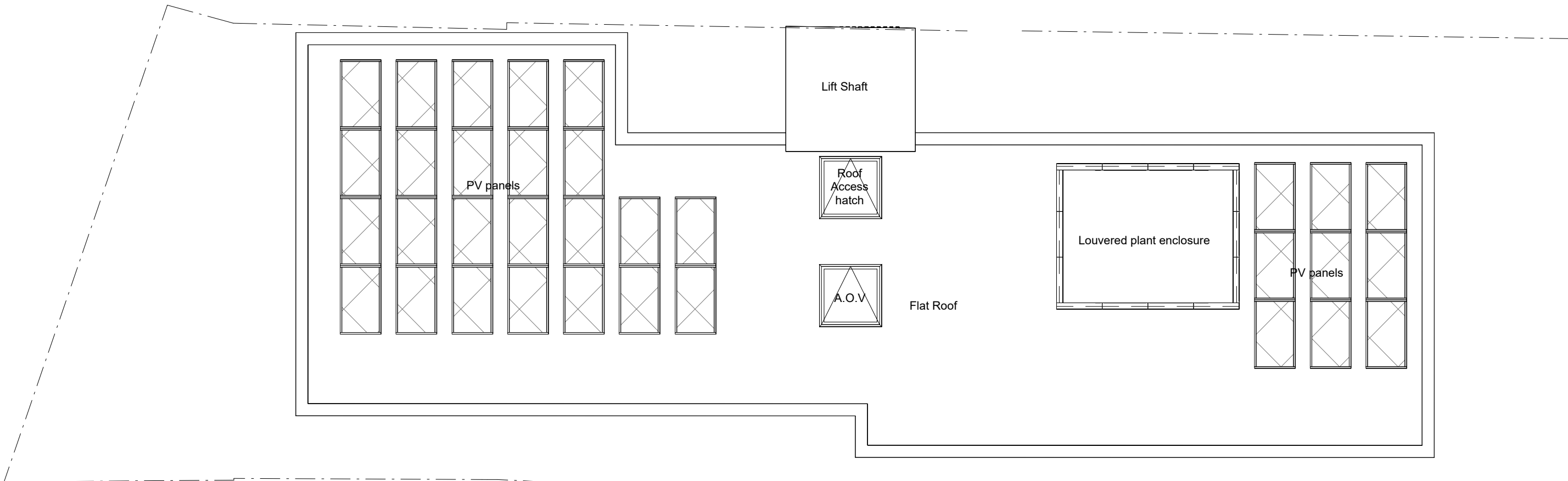
3. Roof Plan



Third
1 : 100



1 : 100



1 : 100

Planning

Key General

Key

1. External walls: Red Brickwork;
2. External walls: Buff Brickwork;
3. External walls: Zinc cladding;
4. Aluminium shop front;
5. Double glazed aluminium windows/doors;
6. Double glazed aluminium windows with obscure glazing;
7. Metal balustrades;
8. Retractable awnings;
9. Aluminium Louvered Doors;
10. AOV (Automatic Opening Vent).
11. Aluminium brise soleil

General Notes

1. Indicative Lift Model: KONE
MonoSpace® 500
Rated Load: 800Kg
Number of persons: 10

Car Size: 1350 (W) x 1400 (D)
Lift Shaft: 1700 (D) x 1940 (W)

Proposed Areas - GIA

Third Floor

No. of Flats: 3

Flat 8:	2b3p	63m ²
Flat 9:	1b2p	50m ²
Flat 10:	3b6p	111m ²

Proposed Areas - GIA

Fourth Floor

No. of Flats: 2

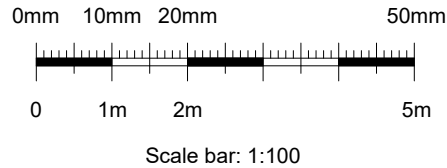
Flat 11: 2b3p 64m²
Flat 12: 2b3p 61m²

Tota

No. of Flats: 12

Type of Flats:

1b	x 3 - 25%
2b	x 6 - 50%
3b	x 3 - 25%



No scaled dimensions to be taken from this drawings. All dimensions to be site checked

[illegible]

CG ARCHITECTS

36 CANNON HILL, LONDON N14 6LG
T. 020 8449 5100

Client:
Adelfia Property Ltd

Site:
13 Bedford Road
London, N22 7AU

Title:

Floor Plans as Proposed

Scale: As indicated@ A1	Drawn: -	Checked: CG
Date: February 2024		
Drg No 1544/06	REV A	