



EAL CONSULT BUILDING SUSTAINABILITY SINCE 2008

ENERGY & SUSTAINABILITY ASSESSMENT

2 MIDCROFT

PROPERTY ADDRESS

**2 MIDCROFT
RUISLIP
HA4 8ES**

DATE

October 2025

PREPARED BY

EAL Consult

CONTENTS

1.	EXECUTIVE SUMMARY	3
2.	METHODOLOGY	5
3.	PLANNING POLICY CONTEXT	6
4.	ENERGY STRATEGY	9
a.	Baseline Model.....	10
b.	Be 'Lean' – Demand Reduction	10
c.	Be 'Clean' – Supply Energy Efficiently	11
d.	Be 'Green' – Renewable Energy	13
e.	Be 'Seen' – Monitoring Performance.....	15
5.	SUSTAINABILITY STRATEGY	16
a.	Sustainable Design	16
b.	Overheating Strategy	17
c.	Water Efficiency	18
d.	Pollution: Light, Air and Noise.....	18
e.	Waste Management.....	19
f.	Flood Risk	19
g.	Sustainable Procurement.....	19
h.	Biodiversity and Green Infrastructure	19
6.	CONCLUSION.....	21
7.	APPENDIX	22
A.	SAP Calculations	22
i.	Be Lean.....	22
ii.	Be Green/ TER Baseline.....	23
B.	GHA Overheating Tool	24

1.EXECUTIVE SUMMARY

Site description

This Energy and Sustainability Assessment has been prepared to support the planning application for the erection of a 4-storey development to contain 7 new build residential units.

Strategy

The strategy highlights how the proposed development will promote sustainability throughout both design and operation and responds to the UK Planning and regulatory framework, National Planning Policy Framework 2024, the London Plan 2021 and Hillingdon's Local Plan Strategic Policies, 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 **3%** 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 Solar Photovoltaic Panels have been proposed for the specific scheme and will deliver a further **64%** 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 **67%**

Overheating

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

Ventilation

The development utilises natural ventilation in the building.

Sustainable Design:

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

Reducing Waste and Supporting the Circular Economy:

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

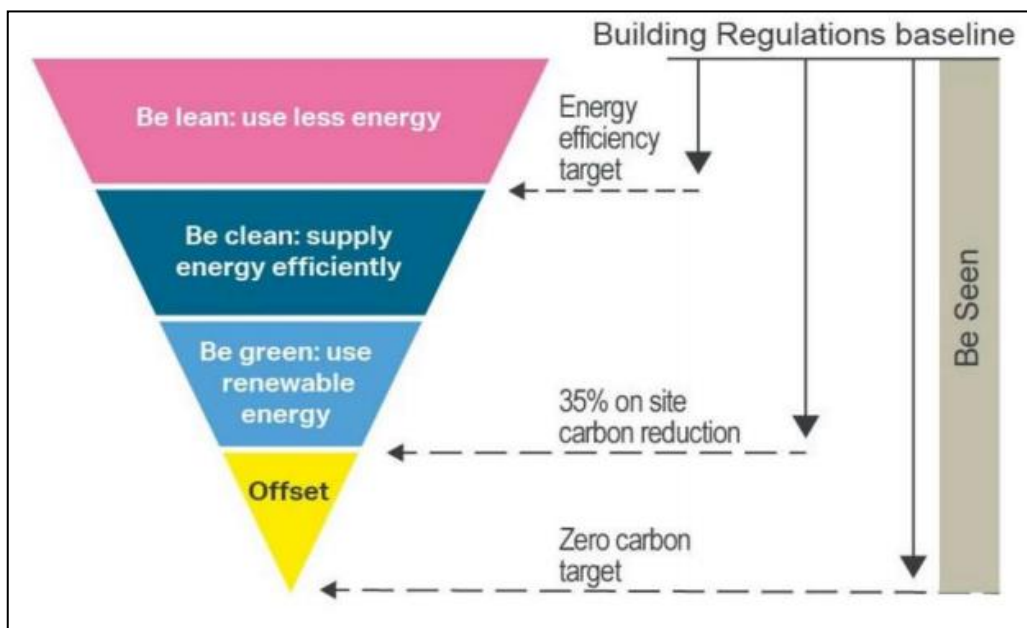
2.METHODOLOGY

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

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

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

Figure 1: The 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 (2021) software 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) 2024

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

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

The London Plan 2021

Policy SI 2 Minimising Greenhouse Gas Emissions:

- A. 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, ii) Be seen: monitor, verify and report on energy performance
- B. 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.

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.

Hillingdon Local Plan Part 1 – Strategic Policies (2012)

Policy EM1: Climate Change Adaptation and Mitigation

The Council will ensure that climate change mitigation is addressed at every stage of the development process by:

1. Prioritising higher density development in urban and town centres that are well served by sustainable forms of transport.
2. Promoting a modal shift away from private car use and requiring new development to include innovative initiatives to reduce car dependency.
3. Ensuring development meets the highest possible design standards whilst still retaining competitiveness within the market.
4. Working with developers of major schemes to identify the opportunities to help provide efficiency initiatives that can benefit the existing building stock.
5. Promoting the use of decentralised energy within large scale development whilst improving local air quality levels.
6. Targeting areas with high carbon emissions for additional reductions through low carbon strategies. These strategies will also have an objective to minimise other pollutants that impact on local air quality. Targeting areas of poor air quality for additional emissions reductions.
7. Encouraging sustainable techniques to land remediation to reduce the need to transport waste to landfill. In particular developers should consider remediation as part of their proposals.
8. Encouraging the installation of renewable energy for all new development in meeting the carbon reduction targets savings set out in the London Plan. Identify opportunities for new sources of electricity generation including anaerobic digestion, hydroelectricity and a greater use of waste as a resource.
9. Promoting new development to contribute to the upgrading of existing housing stock where appropriate.

The Borough will ensure that climate change adaptation is addressed at every stage of the development process by:

10. Locating and designing development to minimise the probability and impacts of flooding.
11. Requiring major development proposals to consider the whole water cycle impact which includes flood risk management, foul and surface water drainage and water consumption.
1. Giving preference to development of previously developed land to avoid the loss of further green areas.

Hillingdon Local Plan Part 2 – Development Management Policies (2020)

Policy DMEI 2: Reducing Carbon Emissions

A) All developments are required to make the fullest contribution to minimising carbon dioxide emissions in accordance with London Plan targets.

B) All major development⁷ proposals must be accompanied by an energy assessment showing how these reductions will be achieved.

C) Proposals that fail to take reasonable steps to achieve the required savings will be resisted. However, where it is clearly demonstrated that the targets for carbon emissions cannot be met onsite, the Council may approve the application and seek an off-site contribution to make up for the shortfall.

4. ENERGY STRATEGY

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

The following tables demonstrate the average carbon emissions and savings.

Table 1. 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	6.9	
After Energy Demand Reduction (Be Lean)	6.7	
After Heat Network Connection (Be Clean)	6.7	
After Renewables (Be Green)	2.3	

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

	Regulated Carbon dioxide savings	
	Tonnes CO ₂ per annum	%
Be Lean: Savings from Energy Demand Reduction	0.2	3
Be Clean: Savings from Heat Network	0	0
Be Green: Savings from Renewable Energy	4.4	64
Cumulative on-site savings	4.6	67
Annual savings from off-set payment	2.3	
(Tonnes CO ₂)		
Cumulative savings for off-set payment	69	
Cash in-lieu contribution (£)	6,541	

a. Baseline Model

In accordance with London Plan Policy SI 2, a baseline model is run with Building Regulations Part L target values as set out in SAP 10.2 Appendix R. Any energy generating technologies that are to be included at Be 'Green' stage are also included in the baseline model. This 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 and any active cooling would be provided by electrically powered equipment. The comparative Be 'Lean' model assumes the same heating strategy.

b. Be 'Lean' - Demand Reduction

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 2021 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 **3%** reduction in annual regulated CO₂ emissions over Part L benchmark, therefore demonstrating compliance with Building Regulations Through passive means alone without the utilisation of renewable technologies.

Passive Design Measures

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

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

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

Table 3. Energy Efficient Design Specification

Element	Building Regulations 2021 Standard	Specification
Wall	0.18 W/m ² k	0.13 W/m ² k
Roof	0.11 W/m ² k	0.09 W/m ² k
Floor	0.13 W/m ² k	0.09 W/m ² k
Doors	1.0 W/m ² k	1.0 W/m ² k
Windows	1.2 W/m ² k	1.0 W/m ² k
Rooflights	1.7 W/m ² k	1.0 W/m ² k

Table 4. Development Part L Fabric Energy Efficiency Standard (FEES)

	Target Fabric Energy Efficiency (MWh/year)	Design Fabric Energy Efficiency (MWh/year)	Improvement %
Development Total	35.55	26.46	26

Air Permeability – designed to achieve an air permeability score of 4

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 will be provided by underfloor heating by the ASHP.

Hot Water system – hot water is supplied via the built in cylinder.

Energy Use Intensity and Space Heating Demand

Table 5. 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	20.30	7.60	35	15	SAP10.2

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

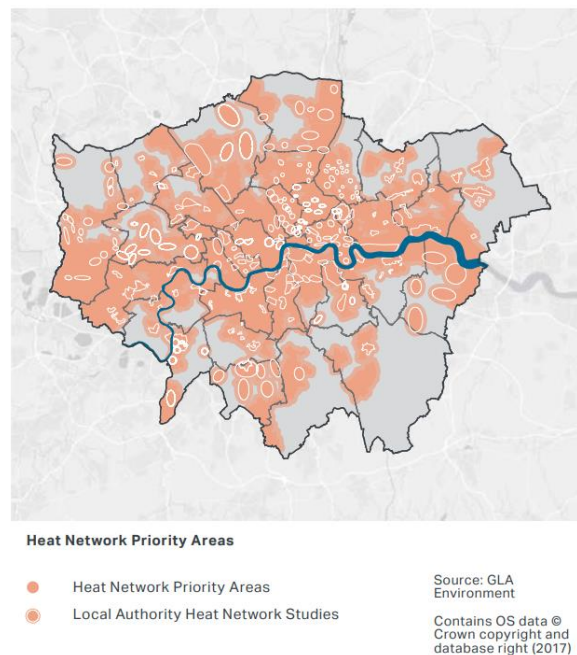
- A. Development Plans, through relevant strategic, site-specific and area-based policies, should seek opportunities to identify and deliver further improvements to air quality and should not reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality.
- B. 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. 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



District Heating and Cooling

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

Community heating and Combined Heat and Power (CHP system)

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

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

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

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

Air Quality

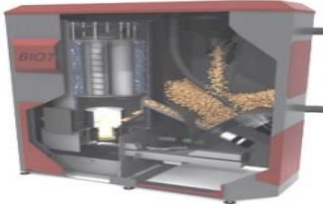
In line with London Plan Policy SI 1 all developments are required to demonstrate compliance with the Building Emission Benchmarks (BEB) set out in the Air Quality Neutral LPG. The BEB demonstrates the emissions from equipment used to supply heat and energy to the buildings.

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

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 6. 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 an air source heat pump and PV panels are to be incorporated in the design because it achieves a CO₂ percentage reduction of **64%** contributing to an overall reduction of **67%** in carbon emissions.

Table 7. Photovoltaic Panels (per flat)

System size	Orientation	Degree	Connection
0.5 kWp	South	30	Multi-dwelling/ Landlord Supply

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.

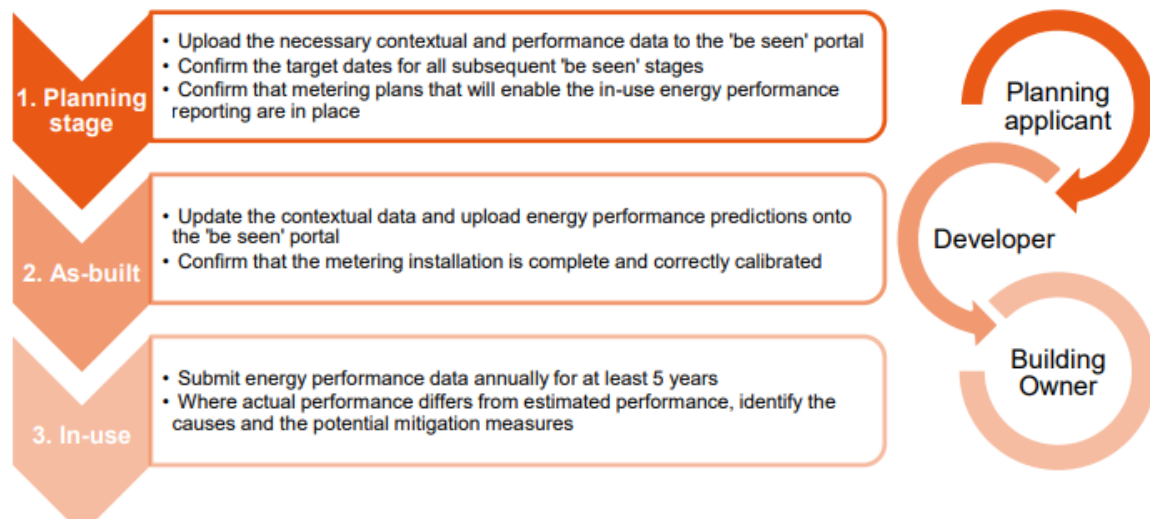
1.2.4 Ensuring that the actual energy and carbon performance of buildings is aligned with the estimated energy and carbon performance will also be a key factor in achieving a zero-carbon London.

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 3 outlines the 'be seen' process through the reporting stages of a development

Figure 3 'Be seen' process and responsibilities



As the units average an EPC rating of B84, the operational running costs will be low due to the high performance. As the development includes renewable technologies it is less reliant on the main grid and will protect the consumer from high prices.

Smart metering equipment will be installed with display of energy usage and generation to raise awareness of users. This can help occupants to reduce demand and subsequent running costs. An on-site operational manual will be provided on completion of the build to assist users to 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:

- Minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems)
- Avoiding internal overheating and contributing to the urban heat island effect
- Efficient use of natural resources (including water), including making the most of natural systems both within and around buildings
- Minimising pollution (including noise, air and urban runoff)
- Minimising the generation of waste and maximising reuse or recycling
- Avoiding impacts from natural hazards (including flooding)
- Ensuring developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions
- Securing sustainable procurement of materials, using local supplies where feasible, and
- 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 project aims to meet the sustainability objectives set out in the National Planning Framework 2024.

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

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

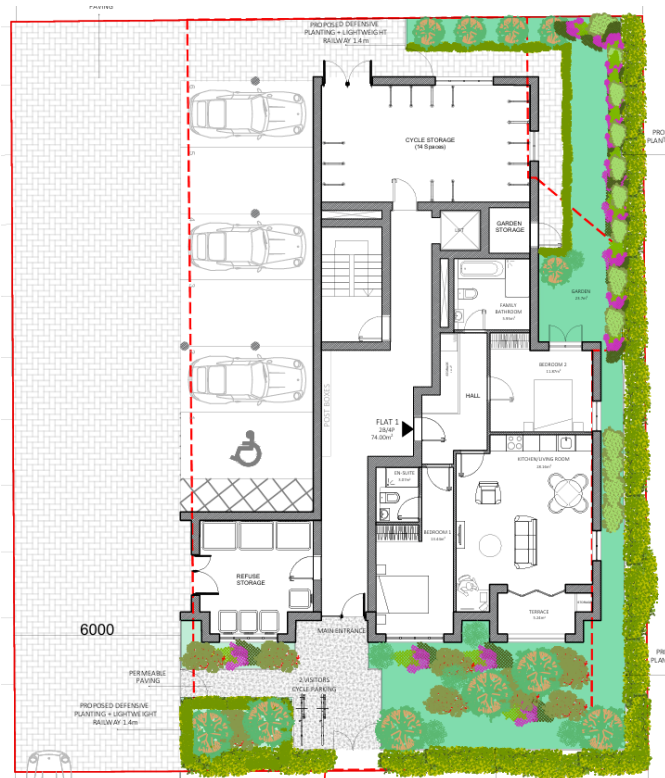
Minimise Heat Generation Through Energy Efficient Design

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 and reduced cold bridging. The GHA Overheating Tool has been completed and can be found in the Appendix. The tool showed a medium risk of overheating.

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 4. Site Plan and Internal GF layout



c. Water Efficiency

Water: Water Efficiency

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

Table 9. 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;

Operational Waste

A space for reuse and recycling has been included at the ground floor.

f. Flood Risk

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

g. Sustainable Procurement

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

Other measures will be implemented:

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

h. Biodiversity and Green Infrastructure

Despite site limitations due to being an existing greyfield site, considerable effort has been given to ensure that the proposal includes a variety of greening and biodiversity measures such as proposed defensive planting, permeable paving, grassy garden areas and a green roof.

6. CONCLUSION

The development has been designed to exceed Part L building regulations requirements. In line with the national and local policies, regulated CO₂ emissions from the development will be reduced by **64%** 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 **64%** contributing to the overall reduction of **67%** in carbon emissions. The remainder is made up from a fabric first approach with U-values outlined in the specification column of Table 3 on Page 10 of this report.

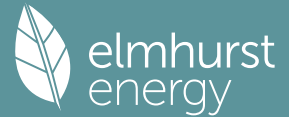
An appraisal of the proposed development has been undertaken against key sustainability objectives identified from relevant policy guidance. The framework for the appraisal was guided by the National Plan. This process has ensured that the development responds to the sustainable development objectives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

7. APPENDIX

A. SAP Calculations

i. Be Lean

Full SAP Calculation Printout



Property Reference	Be Lean Boiler				Issued on Date	24/10/2025
Assessment Reference	Flat 1		Prop Type Ref	Baseline		
Property						
SAP Rating	85 B	DER	14.18	TER	12.53	
Environmental	88 B	% DER < TER				-13.17
CO ₂ Emissions (t/year)	0.99	DFEE	21.18	TFEE	37.32	
Compliance Check	See BREL	% DFEE < TFEE				43.25
% DPER < TPER	-19.13	DPER	78.47	TPER	65.87	
Assessor Details	Mr. Neil Bradford				Assessor ID	T704-0001
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)
Main dwelling			
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.3400		
Dwelling volume			

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) =	0.1106 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50		3.5000 (17)
Infiltration rate		0.2856 (18)
Number of sides sheltered		1 (19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2642 (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	0.3368	0.3302	0.3236	0.2906	0.2840	0.2510	0.2510	0.2444	0.2642	0.2840	0.2972	0.3104 (22b)
Effective ac	0.5567	0.5545	0.5524	0.5422	0.5403	0.5315	0.5315	0.5299	0.5349	0.5403	0.5442	0.5482 (25)

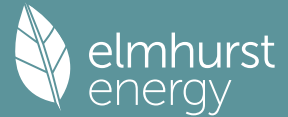
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			15.9200	0.9615	15.3077		(27)
Solid door			2.1300	1.0000	2.1300		(26a)
Heatloss Floor 1			74.0000	0.0900	6.6600	110.0000	8140.0000 (28a)
External Wall 1	50.8300	15.9200	34.9100	0.1300	4.5383	190.0000	6632.9003 (29a)
Corridor Walls	45.9700	2.1300	43.8400	0.1200	5.2608	190.0000	8329.6002 (29a)
Total net area of external elements Aum(A, m ²)			170.8000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.8968		(33)
Main dwelling							
Party Ceiling 1			74.0000			30.0000	2220.0000 (32b)
Internal Wall 1			125.9700			9.0000	1133.7300 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	26456.2306 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		351.1578 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	8.5900	0.0410	0.3522
E1 Steel lintel with perforated steel base plate	7.5800	0.0060	0.0455
E3 Sill	25.2000	0.0100	0.2520
E4 Jamb	42.8500	0.0600	2.5710
E5 Ground floor (normal)	9.6000	0.0340	0.3264
E16 Corner (normal)			

Full SAP Calculation Printout



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

3.5471 (36)
0.0000
(33) + (36) + (36a) = 37.4439 (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	33.2197	33.0883	32.9594	32.3543	32.2410	31.7139	31.7139	31.6163	31.9170	32.2410	32.4701	32.7096	(38)
Heat transfer coeff	70.6636	70.5321	70.4033	69.7981	69.6849	69.1578	69.1578	69.0602	69.3608	69.6849	69.9140	70.1534	(39)
Average = Sum(39)m / 12 =												69.7976	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9379	0.9362	0.9345	0.9264	0.9249	0.9179	0.9179	0.9166	0.9206	0.9249	0.9280	0.9312	(40)
HLP (average)												0.9264	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3685 (42)
Hot water usage for mixer showers													
87.9061	86.5850	84.6600	80.9768	78.2587	75.2274	73.5045	75.4150	77.5092	80.7638	84.5261	87.5693	87.5693	(42a)
Hot water usage for baths													
27.6160	27.2058	26.6283	25.5633	24.7660	23.8818	23.4042	23.9777	24.6022	25.5483	26.6351	27.5226	27.5226	(42b)
Hot water usage for other uses													
38.8859	37.4718	36.0578	34.6438	33.2297	31.8157	31.8157	33.2297	34.6438	36.0578	37.4718	38.8859	38.8859	(42c)
Average daily hot water use (litres/day)												142.0016	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	154.4079	151.2627	147.3461	141.1839	136.2544	130.9249	128.7244	132.6224	136.7551	142.3699	148.6331	153.9777	(44)
Energy conte	244.5444	215.3960	226.4654	193.2737	183.4245	160.9875	155.6810	164.2142	168.6327	193.1946	211.7551	241.0919	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
36.6817	32.3094	33.9698	28.9911	27.5137	24.1481	23.3521	24.6321	25.2949	28.9792	31.7633	36.1638	36.1638	(46)
Water storage loss:													
Store volume													80.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.4300 (48)
Temperature factor from Table 2b													0.6000 (49)
Enter (49) or (54) in (55)													0.8580 (55)
Total storage loss													
26.5980	24.0240	26.5980	25.7400	26.5980	25.7400	26.5980	26.5980	25.7400	26.5980	25.7400	26.5980	26.5980	(56)

If cylinder contains dedicated solar storage													
26.5980	24.0240	26.5980	25.7400	26.5980	25.7400	26.5980	26.5980	25.7400	26.5980	25.7400	26.5980	26.5980	(57)
Primary loss	31.1612	28.1456	31.1612	30.1560	31.1612	22.5120	23.2624	23.2624	22.5120	31.1612	30.1560	31.1612	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
302.3036	267.5656	284.2246	249.1697	241.1837	209.2395	205.5414	214.0746	216.8847	250.9538	267.6511	298.8511	298.8511	(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	302.3036	267.5656	284.2246	249.1697	241.1837	209.2395	205.5414	214.0746	216.8847	250.9538	267.6511	298.8511	(64)
12Total per year (kWh/year)													3007.6434 (64)
Electric shower(s)													3008 (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													
127.5184	113.3549	121.5071	108.9803	107.1960	92.1299	91.6522	94.4896	94.6720	110.4446	115.1254	126.3704	126.3704	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
105.8770	117.2209	105.8770	109.4062	105.8770	109.4062	105.8770	105.8770	109.4062	105.8770	109.4062	105.8770	105.8770	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
209.4269	211.6001	206.1237	194.4651	179.7483	165.9165	156.6761	154.5029	159.9792	171.6378	186.3547	200.1864	200.1864	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	(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)													
-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	(71)
Water heating gains (Table 5)													
171.3957	168.6828	163.3160	151.3615	144.0807	127.9582	123.1885	127.0021	131.4889	148.4470	159.8963	169.8527	169.8527	(72)
Total internal gains	548.2271	559.0314	536.8442	516.7604	491.2335	461.8085	444.2691	445.9095	459.4019	487.4893	517.1847	537.4437	(73)

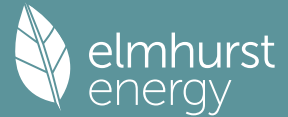
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Northeast				2.5200	11.2829	0.6300	0.0000	0.7700	13.7929	(75)			
Southeast				4.5800	36.7938	0.6300	0.0000	0.7700	81.7470	(77)			
Southwest				8.8200	36.7938	0.6300	0.0000	0.7700	157.4254	(79)			
Solar gains	252.9653	435.4749	608.0048	773.7447	885.2762	887.0637	851.8160	767.3565	665.2062	484.5736	303.8284	215.9457	(83)
Total gains	801.1924	994.5063	1144.8491	1290.5051	1376.5097	1348.8722	1296.0851	1213.2660	1124.6081	972.0629	821.0132	753.3894	(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)													

Full SAP Calculation Printout



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	103.9991	104.1930	104.3836	105.2887	105.4598	106.2635	106.2635	106.4137	105.9525	105.4598	105.1143	104.7554
alpha	7.9333	7.9462	7.9589	8.0192	8.0307	8.0842	8.0842	8.0942	8.0635	8.0307	8.0076	7.9837
util living area	0.9846	0.9377	0.8313	0.6467	0.4702	0.3281	0.2348	0.2618	0.4253	0.7262	0.9485	0.9897 (86)
MIT	20.6349	20.7917	20.9033	20.9529	20.9606	20.9615	20.9615	20.9615	20.9612	20.9456	20.8001	20.6001 (87)
Th 2	20.1354	20.1369	20.1383	20.1451	20.1464	20.1523	20.1523	20.1534	20.1500	20.1464	20.1438	20.1411 (88)
util rest of house	0.9789	0.9195	0.7966	0.6037	0.4273	0.2847	0.1895	0.2136	0.3731	0.6737	0.9297	0.9857 (89)
MIT 2	19.8174	19.9642	20.0591	20.1015	20.1073	20.1138	20.1138	20.1149	20.1113	20.0990	19.9809	19.7889 (90)
Living area fraction	20.1108	20.2612	20.3620	20.4070	20.4135	20.4180	20.4180	20.4188	20.4163	20.4028	20.2749	20.0800 (91)
MIT	20.1108	20.2612	20.3620	20.4070	20.4135	20.4180	20.4180	20.4188	20.4163	20.4028	20.2749	20.0800 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1108	20.2612	20.3620	20.4070	20.4135	20.4180	20.4180	20.4188	20.4163	20.4028	20.2749	20.0800 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9787	0.9224	0.8060	0.6171	0.4408	0.2983	0.2037	0.2288	0.3894	0.6899	0.9330	0.9853 (94)
Useful gains	784.1101	917.2894	922.8039	796.3087	606.7267	402.3443	264.0453	277.5356	437.9719	670.6456	765.9730	742.3216 (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	1117.2478	1083.4554	975.9339	803.1693	607.2014	402.3603	264.0458	277.5369	438.1055	683.1089	921.1120	1114.0364 (97)
Space heating kWh	247.8544	111.6635	39.5287	4.9396	0.3532	0.0000	0.0000	0.0000	0.0000	9.2727	111.7001	276.5558 (98a)
Space heating requirement - total per year (kWh/year)												801.8680
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	247.8544	111.6635	39.5287	4.9396	0.3532	0.0000	0.0000	0.0000	0.0000	9.2727	111.7001	276.5558 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												801.8680
Space heating per m2										(98c) / (4) =		10.6433 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												84.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	247.8544	111.6635	39.5287	4.9396	0.3532	0.0000	0.0000	0.0000	0.0000	9.2727	111.7001	276.5558 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	295.0648	132.9328	47.0580	5.8805	0.4205	0.0000	0.0000	0.0000	0.0000	11.0389	132.9763	329.2331 (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	302.3036	267.5656	284.2246	249.1697	241.1837	209.2395	205.5414	214.0746	216.8847	250.9538	267.6511	298.8511 (64)
Efficiency of water heater (217)m	78.1937	76.6882	75.0915	74.1716	74.0129	74.0000	74.0000	74.0000	74.0000	74.3152	76.6882	74.0000 (216)
Fuel for water heating, kWh/month	386.6084	348.9008	378.5045	335.9366	325.8672	282.7560	277.7586	289.2900	293.0875	337.6881	349.0120	380.7455 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	21.5495	17.2878	15.5657	11.4041	8.8089	7.1969	8.0358	10.4452	13.5673	17.8010	20.1062	22.1484 (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												954.6048 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												74.0000
Water heating fuel used												3986.1553 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans: central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												173.9167 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)

Full SAP Calculation Printout



Total delivered energy for all uses

5155.6768 (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	954.6048	0.2100	200.4670	(261)
Total CO ₂ associated with community systems			0.0000	(373)
Water heating (other fuel)			837.0926	(264)
Space and water heating	3986.1553	0.2100	1037.5596	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	173.9167	0.1443	25.1016	(268)
Total CO ₂ , kg/year			1068.3484	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.1800	(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	954.6048	1.1300	1078.7034	(275)
Total CO ₂ associated with community systems			0.0000	(473)
Water heating (other fuel)			4504.3555	(278)
Space and water heating	3986.1553	1.1300	5583.0589	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	173.9167	1.5338	266.7593	(282)
Total Primary energy kWh/year			5911.8430	(286)
Dwelling Primary energy Rate (DPER)			78.4700	(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)	
Main dwelling	75.3400	2.4000	180.8160	(1b) - (3b)
Ground floor				(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.3400		180.8160	(5)
Dwelling volume				(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) =	0.1659 (8)
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	5.0000		(17)
Infiltration rate	0.4159		(18)
Number of sides sheltered	1		(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3847	(21)

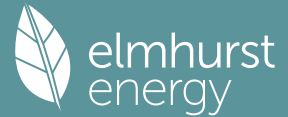
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4905	0.4809	0.4713	0.4232	0.4136	0.3655	0.3655	0.3559	0.3847	0.4136	0.4328	0.4520	(22b)
Effective ac	0.6203	0.6156	0.6111	0.5895	0.5855	0.5668	0.5668	0.5633	0.5740	0.5855	0.5937	0.6022	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			2.1300	1.0000	2.1300			(26a)
TER Opening Type			15.9200	1.1450	18.2290			(27)
Heatloss Floor 1			74.0000	0.1300	9.6200			(28a)
External Wall 1	50.8300	15.9200	34.9100	0.1800	6.2838			(29a)
Corridor Walls	45.9700	2.1300	43.8400	0.1800	7.8912			(29a)
Total net area of external elements Aum(A, m ²)			170.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.1540			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							360.9800	(35)
List of Thermal Bridges								

SAP 10 Online 2.24.2 Page 5 of 7

Full SAP Calculation Printout



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	83.0571	83.3124	83.5642	84.7675	84.9965	86.0791	86.0791	86.2826	85.6588	84.9965	84.5345	84.0569	
alpha	6.5371	6.5542	6.5709	6.6512	6.6664	6.7386	6.7386	6.7522	6.7106	6.6664	6.6356	6.6038	
util living area	0.9973	0.9913	0.9742	0.9103	0.7650	0.5577	0.4021	0.4431	0.6889	0.9380	0.9920	0.9981 (86)	
MIT	20.1120	20.2998	20.5300	20.7958	20.9487	20.9946	20.9995	20.9990	20.9798	20.7780	20.3987	20.0849 (87)	
Th 2	19.9142	19.9171	19.9200	19.9337	19.9363	19.9482	19.9482	19.9504	19.9436	19.9363	19.9311	19.9257 (88)	
util rest of house	0.9961	0.9874	0.9626	0.8748	0.6955	0.4688	0.3063	0.3426	0.5943	0.9045	0.9877	0.9971 (89)	
MIT 2	18.9060	19.1462	19.4343	19.7533	19.9026	19.9461	19.9481	19.9502	19.9342	19.7445	19.2841	18.8804 (90)	
Living area fraction									fLA = Living area / (4) =				0.3589 (91)
MIT	19.3388	19.5602	19.8276	20.1274	20.2781	20.3224	20.3254	20.3266	20.3095	20.1154	19.6841	19.3127 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.3388	19.5602	19.8276	20.1274	20.2781	20.3224	20.3254	20.3266	20.3095	20.1154	19.6841	19.3127 (93)	

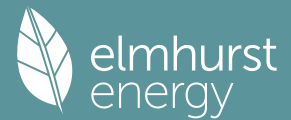
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9951	0.9857	0.9614	0.8821	0.7190	0.5008	0.3408	0.3788	0.6283	0.9112	0.9863	0.9964 (94)
Useful gains	667.8134	785.7760	850.3428	856.2611	730.9492	499.7603	326.8012	343.4925	537.4203	692.3750	664.6698	634.9401 (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	1367.8644	1329.3425	1204.8632	1000.5920	762.4214	502.2125	326.9540	343.7981	547.6301	845.7318	1124.5910	1358.2340 (97)
Space heating kWh	520.8379	365.2767	263.7632	103.9183	23.4153	0.0000	0.0000	0.0000	0.0000	114.0974	331.1432	538.1306 (98a)
Space heating requirement - total per year (kWh/year)												2260.5827
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	520.8379	365.2767	263.7632	103.9183	23.4153	0.0000	0.0000	0.0000	0.0000	114.0974	331.1432	538.1306 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2260.5827
Space heating per m2										(98c) / (4) =		30.0051 (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	520.8379	365.2767	263.7632	103.9183	23.4153	0.0000	0.0000	0.0000	0.0000	114.0974	331.1432	538.1306	(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)	564.2881	395.7494	285.7673	112.5875	25.3687	0.0000	0.0000	0.0000	0.0000	123.6159	358.7684	583.0235	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	216.9293	191.6723	203.4927	178.9330	173.3861	156.1907	154.2638	160.5125	162.3781	181.0851	192.5190	214.5934	(64)
Efficiency of water heater	85.9497	85.4821	84.6426	82.8864	80.7740	79.8000	79.8000	79.8000	79.8000	83.0537	85.2647	79.8000	(216)
Fuel for water heating, kWh/month	252.3909	224.2250	240.4140	215.8775	214.6557	195.7277	193.3131	201.1435	203.4813	218.0339	225.7899	249.4293	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.9991	17.6485	15.8905	11.6421	8.9927	7.3471	8.2034	10.6631	13.8503	18.1724	20.5257	22.6106	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-25.5379	-37.1182	-54.9895	-63.7885	-70.4800	-66.4011	-65.5833	-61.0739	-53.4062	-43.3113	-28.4679	-21.9505	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-11.2329	-23.9334	-48.1357	-73.1301	-97.5118	-98.2754	-97.1232	-81.8656	-59.5180	-34.5068	-15.0876	-8.8606	(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												2449.1687	(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												2634.4817	(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)												177.5457	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1241.2894	(233)
Wind generation												0.0000	(234)

Full SAP Calculation Printout



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	4105.9067 (238)

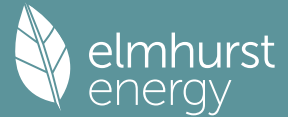
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2449.1687	0.2100	514.3254 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2634.4817	0.2100	553.2412 (264)
Space and water heating			1067.5666 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	177.5457	0.1443	25.6253 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-592.1083	0.1339	-79.3107
PV Unit electricity exported	-649.1811	0.1256	-81.5110
Total			-160.8217 (269)
Total CO2, kg/year			944.2995 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.5300 (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	2449.1687	1.1300	2767.5606 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2634.4817	1.1300	2976.9643 (278)
Space and water heating			5744.5249 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	177.5457	1.5338	272.3255 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-592.1083	1.4950	-885.2059
PV Unit electricity exported	-649.1811	0.4609	-299.1909
Total			-1184.3968 (283)
Total Primary energy kWh/year			4962.5544 (286)
Target Primary Energy Rate (TPER)			65.8700 (287)

Full SAP Calculation Printout



Property Reference	Be Lean Boiler				Issued on Date	24/10/2025
Assessment Reference	Flat 2		Prop Type Ref	Baseline		
Property						
SAP Rating	86 B	DER	13.44	TER	11.54	
Environmental	89 B	% DER < TER				-16.46
CO ₂ Emissions (t/year)	0.95	DFEE	20.30	TFEE	30.27	
Compliance Check	See BREL	% DFEE < TFEE				32.92
% DPER < TPER	-23.07	DPER	74.46	TPER	60.50	
Assessor Details	Mr. Neil Bradford				Assessor ID	T704-0001
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)
Main dwelling			
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.5000		
Dwelling volume			

2. Ventilation rate

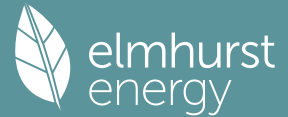
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1089 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3589 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3051 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3890	0.3814	0.3737	0.3356	0.3280	0.2898	0.2898	0.2822	0.3051	0.3280	0.3432	0.3585 (22b)
Effective ac	0.5757	0.5727	0.5698	0.5563	0.5538	0.5420	0.5420	0.5398	0.5465	0.5538	0.5589	0.5643 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			22.0500	0.9615	21.2019		(27)
Solid door			2.1300	1.0000	2.1300		(26a)
Heatloss Floor 1			67.7500	0.0900	6.0975	110.0000	7452.5000 (28a)
Exposed Floor			8.7500	0.0900	0.7875	0.0000	0.0000 (28b)
External Wall 1	50.9000	22.0500	28.8500	0.1300	3.7505	190.0000	5481.5003 (29a)
Corridor Wall	17.4000	2.1300	15.2700	0.1200	1.8324	190.0000	2901.2999 (29a)
Total net area of external elements Aum(A, m ²)			144.8000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.7998		(33)
Main dwelling							
Party Wall 1			24.2600	0.0000	0.0000	180.0000	4366.8000 (32)
Party Floor 1			67.7500			40.0000	2710.0000 (32d)
Party Ceiling 1			76.5000			30.0000	2295.0000 (32b)
Internal Wall 1			101.0400			9.0000	909.3600 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	26116.4603 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							341.3916 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				11.5100	0.0410	0.4719	
E3 Sill				10.5000	0.0060	0.0630	

Full SAP Calculation Printout



E4 Jamb						25.2000	0.0100	0.2520				
E7 Party floor between dwellings (in blocks of flats)						32.3000	0.0000	0.0000				
E16 Corner (normal)						4.8000	0.0340	0.1632				
E18 Party wall between dwellings						4.8000	0.0370	0.1776				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											1.1277	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	36.9275 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.8780	34.7000	34.5255	33.7060	33.5526	32.8389	32.8389	32.7067	33.1138	33.5526	33.8628	34.1871 (38)
Average = Sum(39)m / 12 =	71.8055	71.6275	71.4530	70.6335	70.4802	69.7664	69.7664	69.6342	70.0413	70.4802	70.7904	71.1146 (39)
												70.6328
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9386	0.9363	0.9340	0.9233	0.9213	0.9120	0.9120	0.9103	0.9156	0.9213	0.9254	0.9296 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	0.9233
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3931 (42)
Hot water usage for mixer showers												
Hot water usage for baths	88.4731	87.1435	85.2061	81.4991	78.7634	75.7127	73.9786	75.9014	78.0091	81.2847	85.0713	88.1341 (42a)
Hot water usage for other uses	27.7933	27.3805	26.7992	25.7275	24.9250	24.0351	23.5545	24.1317	24.7601	25.7123	26.8061	27.6993 (42b)
Average daily hot water use (litres/day)	39.1377	37.7145	36.2913	34.8682	33.4450	32.0218	32.0218	33.4450	34.8682	36.2913	37.7145	39.1377 (42c)
												142.9177 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	155.4041	152.2386	148.2967	142.0947	137.1334	131.7696	129.5548	133.4780	137.6374	143.2884	149.5920	154.9712 (44)
Energy content (annual)	246.1221	216.7857	227.9264	194.5206	184.6079	162.0261	156.6854	165.2737	169.7207	194.4410	213.1212	242.6474 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2373.8782
Water storage loss:	36.9183	32.5179	34.1890	29.1781	27.6912	24.3039	23.5028	24.7911	25.4581	29.1662	31.9682	36.3971 (46)
Total storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	297.0810	262.8131	278.8853	243.8357	235.5668	211.3411	207.6443	216.2326	219.0358	245.3999	262.4363	293.6063 (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	297.0810	262.8131	278.8853	243.8357	235.5668	211.3411	207.6443	216.2326	219.0358	245.3999	262.4363	293.6063 (64)
12Total per year (kWh/year)												2973.8782 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	94.5753	83.5881	88.5253	77.0069	74.1219	66.2024	64.8376	67.6932	68.7609	77.3914	83.1916	93.4200 (65)
												2974 (64)

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	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.9148	118.3699	106.9148	110.4786	106.9148	110.4786	106.9148	106.9148	110.4786	106.9148	110.4786	106.9148 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	211.9705	214.1701	208.6272	196.8270	181.9314	167.9317	158.5790	156.3794	161.9223	173.7225	188.6181	202.6178 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655 (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)	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239 (71)
Water heating gains (Table 5)	127.1174	124.3870	118.9856	106.9540	99.6261	91.9478	87.1473	90.9855	95.5013	104.0206	115.5439	125.5645 (72)
Total internal gains	507.8992	518.8236	496.4241	476.1561	450.3689	429.2546	411.5376	413.1762	426.7986	446.5544	476.5370	496.9936 (73)

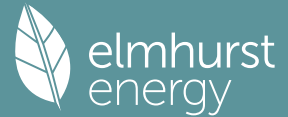
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast				4.4100	11.2829		0.6300		0.0000		0.7700		24.1375 (75)
Southeast				8.8200	36.7938		0.6300		0.0000		0.7700		157.4254 (77)
Southwest				8.8200	36.7938		0.6300		0.0000		0.7700		157.4254 (79)
Solar gains	338.9884	585.4401	822.3206	1054.5903	1213.8099	1219.3635	1169.6326	1048.6566	902.4140	652.7779	407.4900		289.1586 (83)
Total gains	846.8875	1104.2636	1318.7446	1530.7464	1664.1788	1648.6181	1581.1701	1461.8327	1329.2126	1099.3323	884.0270		786.1522 (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)	

Full SAP Calculation Printout



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	101.0309	101.2820	101.5293	102.7072	102.9307	103.9837	103.9837	104.1811	103.5756	102.9307	102.4797	102.0124	
alpha	7.7354	7.7521	7.7686	7.8471	7.8620	7.9322	7.9322	7.9454	7.9050	7.8620	7.8320	7.8008	
util living area	0.9791	0.9040	0.7563	0.5558	0.3937	0.2708	0.1941	0.2191	0.3635	0.6573	0.9282	0.9866	(86)
MIT	20.6488	20.8296	20.9273	20.9570	20.9602	20.9607	20.9608	20.9608	20.9605	20.9517	20.8227	20.6074	(87)
Th 2	20.1348	20.1367	20.1387	20.1477	20.1494	20.1573	20.1573	20.1588	20.1543	20.1494	20.1460	20.1424	(88)
util rest of house	0.9717	0.8805	0.7192	0.5175	0.3578	0.2352	0.1570	0.1790	0.3190	0.6072	0.9052	0.9816	(89)
MIT 2	19.8306	19.9965	20.0767	20.1062	20.1097	20.1181	20.1181	20.1196	20.1149	20.1051	20.0024	19.7979	(90)
Living area fraction										FLA = Living area / (4) =		0.3744	(91)
MIT	20.1369	20.3084	20.3951	20.4247	20.4281	20.4336	20.4336	20.4345	20.4315	20.4221	20.3095	20.1009	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1369	20.3084	20.3951	20.4247	20.4281	20.4336	20.4336	20.4345	20.4315	20.4221	20.3095	20.1009	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9717	0.8855	0.7305	0.5300	0.3696	0.2469	0.1691	0.1922	0.3336	0.6235	0.9100	0.9814	(94)
Useful gains	822.9492	977.8266	963.3556	811.3369	615.0050	406.9820	267.4540	280.9421	443.4147	685.3910	804.5044	771.4961	(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	1137.1771	1103.6631	992.8495	814.0318	615.1600	406.9867	267.4542	280.9426	443.4651	692.2603	935.1047	1130.7895	(97)
Space heating kWh	233.7856	84.5621	21.9435	1.9403	0.1154	0.0000	0.0000	0.0000	0.0000	5.1108	94.0322	267.3143	(98a)
Space heating requirement - total per year (kWh/year)												708.8041	
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	233.7856	84.5621	21.9435	1.9403	0.1154	0.0000	0.0000	0.0000	0.0000	5.1108	94.0322	267.3143	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												708.8041	
Space heating per m2										(98c) / (4) =		9.2654	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	84.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	233.7856	84.5621	21.9435	1.9403	0.1154	0.0000	0.0000	0.0000	0.0000	5.1108	94.0322	267.3143	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	278.3162	100.6692	26.1232	2.3099	0.1374	0.0000	0.0000	0.0000	0.0000	6.0842	111.9432	318.2313	(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	297.0810	262.8131	278.8853	243.8357	235.5668	211.3411	207.6443	216.2326	219.0358	245.3999	262.4363	293.6063	(64)
Efficiency of water heater												75.0000	(216)
(217)m	78.7141	77.0085	75.5908	75.0635	75.0039	75.0000	75.0000	75.0000	75.0000	75.1643	77.1814	79.0356	(217)
Fuel for water heating, kWh/month	377.4180	341.2779	368.9410	324.8392	314.0726	281.7882	276.8590	288.3101	292.0477	326.4847	340.0254	371.4862	(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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	21.7607	17.4573	15.7183	11.5159	8.8952	7.2675	8.1145	10.5476	13.7002	17.9755	20.3032	22.3655	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year													
Space heating fuel - main system 1												843.8145	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												75.0000	
Water heating fuel used												3903.5501	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												175.6215	(232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)

Full SAP Calculation Printout



Total delivered energy for all uses

4963.9860 (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	843.8145	0.2100	177.2010	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)			819.7455	(264)
Space and water heating	3903.5501	0.2100	996.9466	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	175.6215	0.1443	25.3476	(268)
Total CO2, kg/year			1027.9814	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.4400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	843.8145	1.1300	953.5103	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)			4411.0116	(278)
Space and water heating	3903.5501	1.1300	5364.5219	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	175.6215	1.5338	269.3741	(282)
Total Primary energy kWh/year			5695.9208	(286)
Dwelling Primary energy Rate (DPER)			74.4600	(287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	76.5000	2.4000	183.6000	(1b) - (3b)
Ground floor				(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.5000			(5)
Dwelling volume			183.6000	(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	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

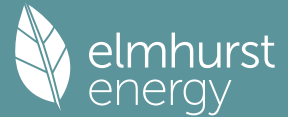
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1634 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4134	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3514 (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	0.4480	0.4392	0.4305	0.3865	0.3777	0.3338	0.3338	0.3250	0.3514	0.3777	0.3953	0.4129	(22b)
Effective ac	0.6004	0.5965	0.5926	0.5747	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			2.1300	1.0000	2.1300			(26a)
TER Opening Type			17.0000	1.1450	19.4656			(27)
Heatloss Floor 1			67.7500	0.1300	8.8075			(28a)
Exposed Floor			8.7500	0.1300	1.1375			(28b)
External Wall 1	50.9000	17.0000	33.9000	0.1800	6.1020			(29a)
Corridor Wall	17.4000	2.1300	15.2700	0.1800	2.7486			(29a)
Total net area of external elements Aum(A, m2)			144.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.3912			(33)
Main dwelling								
Party Wall 1			24.2600	0.0000	0.0000			(32)

Full SAP Calculation Printout



Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												351.3916 (35)
List of Thermal Bridges												
K1 Element						Length		Psi-value		Total		
E1 Steel lintel with perforated steel base plate						11.5100		0.0500		0.5755		
E3 Sill						10.5000		0.0500		0.5250		
E4 Jamb						25.2000		0.0500		1.2600		
E7 Party floor between dwellings (in blocks of flats)						32.3000		0.0700		2.2610		
E16 Corner (normal)						4.8000		0.0900		0.4320		
E18 Party wall between dwellings						4.8000		0.0600		0.2880		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											5.3415 (36)	
Point Thermal bridges											(36a) = 0.0000	
Total fabric heat loss											(33) + (36) + (36a) = 45.7327 (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	36.3747	36.1386	35.9071	34.8200	34.6166	33.6698	33.6698	33.4945	34.0345	34.6166	35.0281	35.4583 (38)
Average = Sum(39)m / 12 =	82.1074	81.8713	81.6399	80.5528	80.3494	79.4026	79.4026	79.2272	79.7673	80.3494	80.7609	81.1910 (39)
												80.5518
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0733	1.0702	1.0672	1.0530	1.0503	1.0379	1.0379	1.0357	1.0427	1.0503	1.0557	1.0613 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												1.0530
												31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.3931 (42)
Hot water usage for mixer showers												
	64.3441	63.3771	61.9681	59.2721	57.2825	55.0638	53.8026	55.2010	56.7339	59.1162	61.8701	64.0976 (42a)
Hot water usage for baths												
	27.7933	27.3805	26.7992	25.7275	24.9250	24.0351	23.5545	24.1317	24.7601	25.7123	26.8061	27.6993 (42b)
Hot water usage for other uses												
	39.1377	37.7145	36.2913	34.8682	33.4450	32.0218	32.0218	33.4450	34.8682	36.2913	37.7145	39.1377 (42c)
Average daily hot water use (litres/day)												120.6716 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	131.2751	128.4722	125.0586	119.8677	115.6525	111.1207	109.3789	112.7776	116.3622	121.1198	126.3907	130.9346 (44)
Energy conte	207.9076	182.9426	192.2105	164.0929	155.6904	136.6358	132.2843	139.6423	143.4862	164.3585	180.0668	205.0119 (45)
Energy content (annual)										Total = Sum(45)m =		2004.3299
Distribution loss (46)m = 0.15 x (45)m	31.1861	27.4414	28.8316	24.6139	23.3536	20.4954	19.8426	20.9463	21.5229	24.6538	27.0100	30.7518 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss												
	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
	258.8665	228.9700	243.1694	213.4080	206.6493	185.9509	183.2432	190.6012	192.8013	215.3174	229.3818	255.9708 (62)
WWHRS	-29.4154	-26.0152	-27.2417	-22.5572	-21.0225	-17.9891	-16.8619	-17.9309	-18.6122	-21.9417	-24.8573	-28.8707 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h												
	229.4511	202.9548	215.9277	190.8508	185.6269	167.9618	166.3813	172.6703	174.1891	193.3756	204.5245	227.1001 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 2331.0140 (64)
Electric shower(s)												2331 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	81.8690	72.3353	76.6497	66.8897	64.5068	57.7602	56.7242	59.1708	60.0379	67.3889	72.2010	80.9062 (65)

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

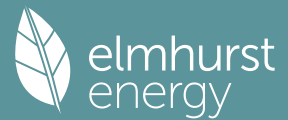
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	106.9223	118.3782	106.9223	110.4863	106.9223	110.4863	106.9223	106.9223	110.4863	106.9223	110.4863	106.9223 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	211.9705	214.1701	208.6272	196.8270	181.9314	167.9317	158.5790	156.3794	161.9223	173.7225	188.6181	202.6178 (68)
Pumps, fans	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655 (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)	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239 (71)
Total internal gains	110.0390	107.6418	103.0238	92.9023	86.7027	80.2225	76.2423	79.5306	83.3860	90.5765	100.2791	108.7449 (72)
	490.8283	502.0866	480.4698	462.1122	437.4529	417.5370	400.6400	401.7287	414.6911	433.1177	461.2800	480.1814 (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				
Northeast			3.4000	11.2829	0.6300	0.7000		0.7700		11.7239 (75)		
Southeast			6.8000	36.7938	0.6300	0.7000		0.7700		76.4638 (77)		
Southwest			6.8000	36.7938	0.6300	0.7000		0.7700		76.4638 (79)		

Solar gains	164.6515	284.3566	399.4128	512.2296	589.5648	592.2623	568.1072	509.3475	438.3154	317.0636	197.9237	140.4485 (83)
Total gains	655.4797	786.4432	879.8826	974.3417	1027.0177	1009.7992	968.7472	911.0762	853.0065	750.1813	659.2037	620.6299 (84)

Full SAP Calculation Printout



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	90.9427	91.2050	91.4635	92.6979	92.9325	94.0407	94.0407	94.2488	93.6107	92.9325	92.4591	91.9692
alpha	7.0628	7.0803	7.0976	7.1799	7.1955	7.2694	7.2694	7.2833	7.2407	7.1955	7.1639	7.1313
util living area	0.9971	0.9894	0.9656	0.8779	0.7059	0.5015	0.3605	0.3997	0.6354	0.9198	0.9908	0.9980 (86)
MIT	20.2305	20.4206	20.6414	20.8717	20.9760	20.9981	20.9999	20.9997	20.9909	20.8434	20.4953	20.2001 (87)
Th 2	20.0227	20.0252	20.0277	20.0394	20.0416	20.0518	20.0518	20.0537	20.0479	20.0416	20.0372	20.0325 (88)
util rest of house	0.9959	0.9850	0.9518	0.8387	0.6418	0.4282	0.2829	0.3177	0.5526	0.8828	0.9861	0.9971 (89)
MIT 2	19.1445	19.3868	19.6601	19.9289	20.0262	20.0511	20.0518	20.0537	20.0437	19.9086	19.4925	19.1137 (90)
Living area fraction									fLA = Living area / (4) =			0.3744 (91)
MIT	19.5511	19.7739	20.0275	20.2818	20.3818	20.4057	20.4067	20.4078	20.3983	20.2586	19.8680	19.5204 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5511	19.7739	20.0275	20.2818	20.3818	20.4057	20.4067	20.4078	20.3983	20.2586	19.8680	19.5204 (93)

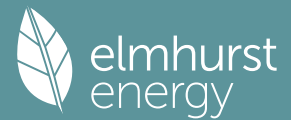
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9950	0.9835	0.9518	0.8494	0.6652	0.4557	0.3120	0.3484	0.5837	0.8923	0.9850	0.9965 (94)
Useful gains	652.2327	773.4626	837.5064	827.6512	683.1344	460.1450	302.2209	317.4344	497.8732	669.4162	649.3042	618.4372 (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	1252.2255	1217.7437	1104.3822	916.8382	697.5785	460.9844	302.2647	317.5303	502.4005	776.0597	1031.1513	1243.8803 (97)
Space heating kWh	446.3947	298.5569	198.5556	64.2147	10.7464	0.0000	0.0000	0.0000	0.0000	79.3427	274.9299	465.3296 (98a)
Space heating requirement - total per year (kWh/year)												1838.0706
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	446.3947	298.5569	198.5556	64.2147	10.7464	0.0000	0.0000	0.0000	0.0000	79.3427	274.9299	465.3296 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1838.0706
Space heating per m2										(98c) / (4) =		24.0271 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	446.3947	298.5569	198.5556	64.2147	10.7464	0.0000	0.0000	0.0000	0.0000	79.3427	274.9299	465.3296 (98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)	
Space heating fuel (main heating system)	483.1111	323.1135	214.8871	69.4964	11.6303	0.0000	0.0000	0.0000	0.0000	85.8688	297.5432	503.6035 (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	229.4511	202.9548	215.9277	190.8508	185.6269	167.9618	166.3813	172.6703	174.1891	193.3756	204.5245	227.1001 (64)	
Efficiency of water heater	85.7810	85.2070	84.2021	82.3045	80.7274	80.3000	80.3000	80.3000	80.3000	82.6254	85.0160	85.8833 (216)	
Fuel for water heating, kWh/month	267.4848	238.1902	256.4399	231.8839	229.9429	209.1679	207.1996	215.0314	216.9229	234.0389	240.5719	264.4288 (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 (221)	
Lighting	22.2163	17.8228	16.0474	11.7570	9.0815	7.4196	8.2844	10.7684	13.9871	18.3518	20.7283	22.8338 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-25.9106	-37.6493	-55.7603	-64.6630	-71.4281	-67.2862	-66.4555	-61.8937	-54.1360	-43.9202	-28.8789	-22.2719 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	-11.4264	-24.3424	-48.9526	-74.3637	-99.1502	-99.9258	-98.7562	-83.2467	-60.5269	-35.0961	-15.3472	-9.0136 (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													1989.2539 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													2811.3031 (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)													179.2985 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1260.4014 (233)
Wind generation													0.0000 (234)

Full SAP Calculation Printout



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	3805.4541 (238)

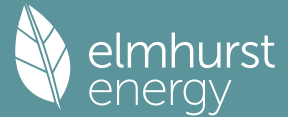
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1989.2539	0.2100	417.7433 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2811.3031	0.2100	590.3736 (264)
Space and water heating			1008.1170 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	179.2985	0.1443	25.8783 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-600.2537	0.1340	-80.4057
PV Unit electricity exported	-660.1476	0.1256	-82.8896
Total			-163.2953 (269)
Total CO2, kg/year			882.6292 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5400 (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	1989.2539	1.1300	2247.8569 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2811.3031	1.1300	3176.7725 (278)
Space and water heating			5424.6293 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	179.2985	1.5338	275.0141 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-600.2537	1.4950	-897.3983
PV Unit electricity exported	-660.1476	0.4609	-304.2512
Total			-1201.6495 (283)
Total Primary energy kWh/year			4628.0947 (286)
Target Primary Energy Rate (TPER)			60.5000 (287)

Full SAP Calculation Printout



Property Reference	Be Lean Boiler				Issued on Date	24/10/2025
Assessment Reference	Flat 3		Prop Type Ref	Baseline		
Property						
SAP Rating	86 B	DER	13.18	TER	13.17	
Environmental	90 B	% DER < TER				-0.08
CO ₂ Emissions (t/year)	0.79	DFEE	23.32	TFEE	33.98	
Compliance Check	See BREL	% DFEE < TFEE				31.39
% DPER < TPER	-5.74	DPER	73.32	TPER	69.34	
Assessor Details	Mr. Neil Bradford				Assessor ID	T704-0001
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)
Main dwelling			
Ground floor	66.9000 (1b)	2.4000 (2b)	160.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	160.5600 (5)

2. Ventilation rate

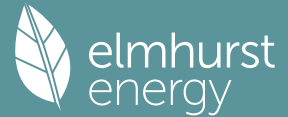
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1246 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3746 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3184 (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	0.4059	0.3980	0.3900	0.3502	0.3423	0.3025	0.3025	0.2945	0.3184	0.3423	0.3582	0.3741 (22b)
Effective ac	0.5824	0.5792	0.5761	0.5613	0.5586	0.5457	0.5457	0.5434	0.5507	0.5586	0.5641	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			17.4300	0.9615	16.7596		(27)
Solid door			2.1300	1.0000	2.1300		(26a)
Heatloss Floor 1			66.9000	0.0900	6.0210	110.0000	7359.0000 (28b)
External Wall 1	49.4600	17.4300	32.0300	0.1300	4.1639	190.0000	6085.6998 (29a)
Corridor Wall	14.8200	2.1300	12.6900	0.1200	1.5228	190.0000	2411.0999 (29a)
Total net area of external elements Aum(A, m ²)			131.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5973		(33)
Main dwelling							
Party Wall 1			21.1100	0.0000	0.0000	180.0000	3799.8001 (32)
Party Ceiling 1			66.9000			30.0000	2007.0000 (32b)
Internal Wall 1			77.6900			9.0000	699.2100 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	22361.8099 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							334.2572 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				10.1100	0.0410	0.4145	
E3 Sill				9.1000	0.0060	0.0546	
E4 Jamb				23.1000	0.0100	0.2310	
E7 Party floor between dwellings (in blocks of flats)				31.4500	0.0000	0.0000	

Full SAP Calculation Printout



E16 Corner (normal)	4.8000	0.0340	0.1632	
E18 Party wall between dwellings	4.8000	0.0370	0.1776	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				1.0409 (36)
Point Thermal bridges				0.0000
Total fabric heat loss			(33) + (36) + (36a) =	31.6382 (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	30.8579	30.6884	30.5222	29.7418	29.5957	28.9160	28.9160	28.7901	29.1778	29.5957	29.8911	30.2000 (38)
Average = Sum(39)m / 12 =	62.4961	62.3266	62.1604	61.3800	61.2340	60.5542	60.5542	60.4283	60.8160	61.2340	61.5294	61.8382 (39)
												61.3793
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9342	0.9316	0.9292	0.9175	0.9153	0.9051	0.9051	0.9033	0.9091	0.9153	0.9197	0.9243 (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												2.1686 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths												
69.8296	68.7925	67.3321	64.6394	62.6231	60.3874	59.1797	60.6299	62.2089	64.6012	67.3494	69.5935	(42b)
Hot water usage for other uses												
36.8384	35.4988	34.1592	32.8197	31.4801	30.1405	30.1405	31.4801	32.8197	34.1592	35.4988	36.8384	(42c)
Average daily hot water use (litres/day)												98.2325 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	106.6680	104.2914	101.4914	97.4591	94.1032	90.5279	89.3202	92.1100	95.0286	98.7605	102.8482	106.4319 (44)
Energy conte	168.9360	148.5095	155.9885	133.4166	126.6810	111.3146	108.0251	114.0514	117.1798	134.0170	146.5262	166.6467 (45)
Energy content (annual)												Total = Sum(45)m = 1631.2924
Distribution loss (46)m = 0.15 x (45)m												
25.3404	22.2764	23.3983	20.0125	19.0021	16.6972	16.2038	17.1077	17.5770	20.1026	21.9789	24.9970	(46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.0620	47.9540	44.6439	45.5166	46.9383	46.8634	50.3273	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
219.8949	194.5369	206.9474	181.4786	174.6350	155.9585	153.5417	160.9897	164.0432	184.3443	195.8413	217.6056	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.8949	194.5369	206.9474	181.4786	174.6350	155.9585	153.5417	160.9897	164.0432	184.3443	195.8413	217.6056 (64)
12Total per year (kWh/year)												2209.8169 (64)
Electric shower(s)												2210 (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												
68.9110	60.8863	64.6059	56.3765	54.1099	48.1731	47.2975	49.6567	50.6781	57.1425	61.0487	68.1497	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289 (66)
95.8113	106.0767	95.8113	99.0050	95.8113	99.0050	95.8113	95.8113	99.0050	95.8113	99.0050	95.8113	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	189.9565	191.9277	186.9604	176.3858	163.0371	150.4913	142.1099	140.1388	145.1060	155.6807	169.0293	181.5751 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431 (71)
Water heating gains (Table 5)	92.6223	90.6046	86.8359	78.3007	72.7284	66.9070	63.5719	66.7428	70.3863	76.8044	84.7899	91.5991 (72)
Total internal gains	436.9187	447.1377	428.1362	412.2201	390.1054	371.9320	357.0217	358.2215	370.0259	386.8250	411.3528	427.5142 (73)

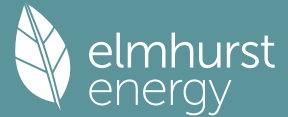
6. Solar gains

[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			
Northeast			2.5200	11.2829	0.6300		0.0000		0.7700		13.7929 (75)	
Southwest			6.0900	36.7938	0.6300		0.0000		0.7700		108.6985 (79)	
Northwest			8.8200	11.2829	0.6300		0.0000		0.7700		48.2750 (81)	
Solar gains	170.7664	311.4947	480.9616	687.7224	854.0859	884.7614	837.6684	707.9197	551.6747	359.0330	208.2932	143.7110 (83)
Total gains	607.6851	758.6323	909.0978	1099.9425	1244.1914	1256.6934	1194.6901	1066.1413	921.7006	745.8580	619.6460	571.2252 (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
	99.3920	99.6623	99.9288	101.1993	101.4407	102.5794	102.5794	102.7931	102.1378	101.4407	100.9537	100.4495

Full SAP Calculation Printout



alpha	7.6261	7.6442	7.6619	7.7466	7.7627	7.8386	7.8386	7.8529	7.8092	7.7627	7.7302	7.6966
util living area	0.9932	0.9684	0.8807	0.6644	0.4571	0.3084	0.2230	0.2607	0.4547	0.8050	0.9757	0.9955 (86)
MIT	20.5282	20.6960	20.8607	20.9481	20.9592	20.9603	20.9603	20.9604	20.9597	20.9241	20.7137	20.4984 (87)
Th 2	20.1386	20.1407	20.1428	20.1527	20.1545	20.1631	20.1631	20.1647	20.1598	20.1545	20.1508	20.1469 (88)
util rest of house	0.9905	0.9579	0.8515	0.6215	0.4158	0.2681	0.1806	0.2134	0.3997	0.7553	0.9656	0.9937 (89)
MIT 2	19.7178	19.8813	20.0297	20.1055	20.1141	20.1234	20.1234	20.1251	20.1198	20.0931	19.9097	19.6960 (90)
Living area fraction	20.1014	20.2669	20.4231	20.5044	20.5142	20.5196	20.5196	20.5205	20.5174	20.4865	20.2903	20.0758 (92)
MIT	20.1014	20.2669	20.4231	20.5044	20.5142	20.5196	20.5196	20.5205	20.5174	20.4865	20.2903	20.0758 (93)
Temperature adjustment												0.0000
adjusted MIT	20.1014	20.2669	20.4231	20.5044	20.5142	20.5196	20.5196	20.5205	20.5174	20.4865	20.2903	20.0758 (93)

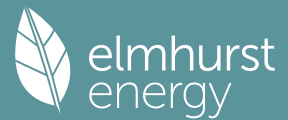
8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9904	0.9596	0.8616	0.6395	0.4334	0.2852	0.1987	0.2335	0.4231	0.7756	0.9676	0.9935 (94)
Ext temp.	601.8339	727.9945	783.3241	703.4147	539.2585	358.4415	237.3471	248.9930	390.0053	578.5015	599.5407	567.4933 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	987.5280	957.7694	865.4674	712.2782	539.7260	358.4552	237.3477	248.9951	390.2794	605.3891	811.5911	981.7312 (97)
Space heating requirement - total per year (kWh/year)	286.9564	154.4087	61.1146	6.3818	0.3478	0.0000	0.0000	0.0000	0.0000	20.0044	152.6762	308.1930 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	286.9564	154.4087	61.1146	6.3818	0.3478	0.0000	0.0000	0.0000	0.0000	20.0044	152.6762	308.1930 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	990.0831
Space heating per m2										(98c) / (4) =		14.7994 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												84.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	286.9564	154.4087	61.1146	6.3818	0.3478	0.0000	0.0000	0.0000	0.0000	20.0044	152.6762	308.1930 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	341.6148	183.8199	72.7555	7.5973	0.4141	0.0000	0.0000	0.0000	0.0000	23.8147	181.7574	366.8965 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	219.8949	194.5369	206.9474	181.4786	174.6350	155.9585	153.5417	160.9897	164.0432	184.3443	195.8413	217.6056 (64)
Efficiency of water heater (217)m	79.8432	78.7328	76.8779	75.2740	75.0160	75.0000	75.0000	75.0000	75.0000	75.7950	78.6936	75.0000 (216)
Fuel for water heating, kWh/month	275.4083	247.0850	269.1896	241.0907	232.7970	207.9446	204.7223	214.6529	218.7242	243.2144	248.8655	80.0257 (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	271.9197 (219)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	0.0000 (221)
Lighting	21.1589	16.9745	15.2836	11.1974	8.6492	7.0665	7.8901	10.2559	13.3214	17.4783	19.7418	3.4822 (231)
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	21.7470 (232)
(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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	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)
(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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1178.6703 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												2875.6144 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												170.7646 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												4266.0493 (238)

Full SAP Calculation Printout



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	1178.6703	0.2100	247.5208 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2875.6144	0.2100	603.8790 (264)
Space and water heating			851.3998 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	170.7646	0.1443	24.6466 (268)
Total CO2, kg/year			881.7336 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.1800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1178.6703	1.1300	1331.8974 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2875.6144	1.1300	3249.4442 (278)
Space and water heating			4581.3417 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	170.7646	1.5338	261.9245 (282)
Total Primary energy kWh/year			4905.2910 (286)
Dwelling Primary energy Rate (DPER)			73.3200 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	66.9000 (1b)	x 2.4000 (2b)	= 160.5600 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	160.5600 (5)

2. Ventilation rate

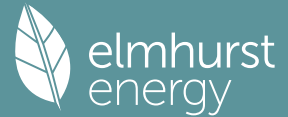
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1246 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3746 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3184 (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	0.4059	0.3980	0.3900	0.3502	0.3423	0.3025	0.3025	0.2945	0.3184	0.3423	0.3582	0.3741 (22b)
Effective ac	0.5824	0.5792	0.5761	0.5613	0.5586	0.5457	0.5457	0.5434	0.5507	0.5586	0.5641	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Semi-glazed door			2.1300	1.0000	2.1300		(26a)
TER Opening Type			14.6000	1.1450	16.7176		(27)
Heatloss Floor 1			66.9000	0.1300	8.6970		(28b)
External Wall 1	49.4600	14.6000	34.8600	0.1800	6.2748		(29a)
Corridor Wall	14.8200	2.1300	12.6900	0.1800	2.2842		(29a)
Total net area of external elements Aum (A, m2)			131.1800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.1036	(33)
Main dwelling							
Party Wall 1			21.1100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							344.2572 (35)
List of Thermal Bridges							

Full SAP Calculation Printout



K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	10.1100	0.0500	0.5055
E3 Sill	9.1000	0.0500	0.4550
E4 Jamb	23.1000	0.0500	1.1550
E7 Party floor between dwellings (in blocks of flats)	31.4500	0.0700	2.2015
E16 Corner (normal)	4.8000	0.0900	0.4320
E18 Party wall between dwellings	4.8000	0.0600	0.2880
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.0370 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	41.1406 (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	30.8579	30.6884	30.5222	29.7418	29.5957	28.9160	28.9160	28.7901	29.1778	29.5957	29.8911	30.2000
Heat transfer coeff	71.9984	71.8289	71.6628	70.8823	70.7363	70.0565	70.0565	69.9307	70.3184	70.7363	71.0317	71.3405
Average = Sum(39)m / 12 =												70.8816
HLP	1.0762	1.0737	1.0712	1.0595	1.0573	1.0472	1.0472	1.0453	1.0511	1.0573	1.0618	1.0664
HLP (average)												1.0595
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1686 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hot water usage for baths	69.8296	68.7925	67.3321	64.6394	62.6231	60.3874	59.1797	60.6299	62.2089	64.6012	67.3494	69.5935
Hot water usage for other uses	36.8384	35.4988	34.1592	32.8197	31.4801	30.1405	30.1405	31.4801	32.8197	34.1592	35.4988	36.8384
Average daily hot water use (litres/day)												98.2325
Daily hot water use	106.6680	104.2914	101.4914	97.4591	94.1032	90.5279	89.3202	92.1100	95.0286	98.7605	102.8482	106.4319
Energy conte	168.9360	148.5095	155.9885	133.4166	126.6810	111.3146	108.0251	114.0514	117.1798	134.0170	146.5262	166.6467
Energy content (annual)										Total = Sum(45)m =		1631.2924
Distribution loss (46)m = 0.15 x (45)m	25.3404	22.2764	23.3983	20.0125	19.0021	16.6972	16.2038	17.1077	17.5770	20.1026	21.9789	24.9970
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Combi loss	50.9589	46.0274	50.9589	48.0620	47.9540	44.6439	45.5166	46.9383	46.8634	50.3273	49.3151	50.9589
Total heat required for water heating calculated for each month	219.8949	194.5369	206.9474	181.4786	174.6350	155.9585	153.5417	160.9897	164.0432	184.3443	195.8413	217.6056
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	219.8949	194.5369	206.9474	181.4786	174.6350	155.9585	153.5417	160.9897	164.0432	184.3443	195.8413	217.6056
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2209.8169
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
Heat gains from water heating, kWh/month	68.9110	60.8863	64.6059	56.3765	54.1099	48.1731	47.2975	49.6567	50.6781	57.1425	61.0487	68.1497
												2210

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

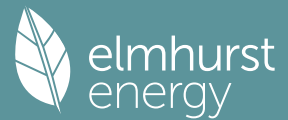
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.8715	106.1435	95.8715	99.0673	95.8715	99.0673	95.8715	95.8715	99.0673	95.8715	99.0673	95.8715
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	189.9565	191.9277	186.9604	176.3858	163.0371	150.4913	142.1099	140.1388	145.1060	155.6807	169.0293	181.5751
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429
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
Losses e.g. evaporation (negative values) (Table 5)	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431
Water heating gains (Table 5)	92.6223	90.6046	86.8359	78.3007	72.7284	66.9070	63.5719	66.7428	70.3863	76.8044	84.7899	91.5991
Total internal gains	436.9790	447.2044	428.1965	412.2824	390.1657	371.9943	357.0820	358.2818	370.0882	386.8853	411.4151	427.5745

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	2.1100	11.2829	0.6300	0.7000	0.7700	7.2757
Southwest	5.1000	36.7938	0.6300	0.7000	0.7700	57.3478
Northwest	7.3900	11.2829	0.6300	0.7000	0.7700	25.4823
Solar gains	90.1059	164.3645	253.7923	362.9045	450.7002	466.8906
Total gains	527.0849	611.5689	681.9888	775.1869	840.8660	838.8848
						799.1203
						731.8470
						661.1973
						576.3357
						521.3227
						75.8297
						503.4041

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	88.8554	89.0651	89.2716	90.2545	90.4408	91.3183	91.3183	91.4827	90.9783	90.4408	90.0647	89.6748
alpha	6.9237	6.9377	6.9514	7.0170	7.0294	7.0879	7.0879	7.0988	7.0652	7.0294	7.0043	6.9783
util living area	0.9981	0.9943	0.9809	0.9148	0.7471	0.5315	0.3855	0.4388	0.7099	0.9547	0.9946	0.9986 (86)
MIT	20.1565	20.3158	20.5380	20.8143	20.9629	20.9969	20.9997	20.9993	20.9802	20.7681	20.4140	20.1309 (87)
Th 2	20.0203	20.0224	20.0244	20.0340	20.0358	20.0442	20.0442	20.0458	20.0410	20.0358	20.0322	20.0284 (88)
util rest of house	0.9973	0.9918	0.9726	0.8830	0.6829	0.4537	0.3019	0.3482	0.6225	0.9297	0.9917	0.9980 (89)
MIT 2	19.0501	19.2544	19.5344	19.8660	20.0111	20.0429	20.0441	20.0456	20.0311	19.8246	19.3881	19.0238 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.5738	19.7568	20.0095	20.3149	20.4617	20.4945	20.4965	20.4971	20.4804	20.2712	19.8738	19.5479 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.5738	19.7568	20.0095	20.3149	20.4617	20.4945	20.4965	20.4971	20.4804	20.2712	19.8738	19.5479 (93)

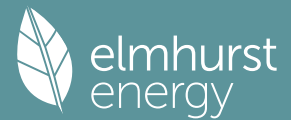
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9968	0.9909	0.9724	0.8932	0.7122	0.4906	0.3415	0.3912	0.6638	0.9368	0.9911	0.9976 (94)
Useful gains	525.3929	606.0142	663.1797	692.3879	598.8794	411.5667	272.8871	286.2885	438.9184	539.9354	516.6943	502.2007 (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	1099.6925	1067.1492	968.1296	809.1157	619.7684	412.9511	272.9759	286.5126	448.6593	684.1063	907.3414	1094.9246 (97)
Space heating kWh	427.2789	309.8827	226.8827	84.0440	15.5415	0.0000	0.0000	0.0000	0.0000	107.2632	281.2659	440.9866 (98a)
Space heating requirement - total per year (kWh/year)	1893.1454											
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000											
Space heating kWh	427.2789	309.8827	226.8827	84.0440	15.5415	0.0000	0.0000	0.0000	0.0000	107.2632	281.2659	440.9866 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1893.1454											
Space heating per m2	(98c) / (4) = 28.2981 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	92.4000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	427.2789	309.8827	226.8827	84.0440	15.5415	0.0000	0.0000	0.0000	0.0000	107.2632	281.2659	440.9866 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	462.4230	335.3709	245.5440	90.9567	16.8198	0.0000	0.0000	0.0000	0.0000	116.0857	304.4003	477.2582 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	219.8949	194.5369	206.9474	181.4786	174.6350	155.9585	153.5417	160.9897	164.0432	184.3443	195.8413	217.6056 (64)
Efficiency of water heater (217)m	85.7786	85.3737	84.5790	82.8364	80.9399	80.3000	80.3000	80.3000	80.3000	83.2628	85.1564	80.3000 (216)
Fuel for water heating, kWh/month	256.3519	227.8651	244.6794	219.0806	215.7589	194.2198	191.2101	200.4853	204.2879	221.4006	229.9783	85.8617 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	19.9202	15.9807	14.3889	10.5419	8.1429	6.6528	7.4282	9.6555	12.5415	16.4551	18.5860	20.4739 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-22.7958	-33.1966	-49.2758	-57.2837	-63.4091	-59.7934	-59.0686	-54.9566	-47.9726	-38.7997	-25.4373	-19.5872 (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)	-9.8558	-21.0162	-42.2967	-64.2966	-85.7633	-86.4351	-85.4106	-71.9701	-52.3012	-30.3008	-13.2389	-7.7722 (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	2048.8586 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	80.3000											
Water heating fuel used	2658.7553 (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)	160.7675 (232)											
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation	-1102.2334 (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												

Full SAP Calculation Printout



Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3852.1480 (238)

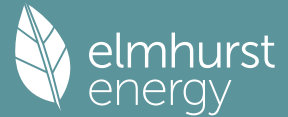
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2048.8586	0.2100	430.2603 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2658.7553	0.2100	558.3386 (264)
Space and water heating			988.5989 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	160.7675	0.1443	23.2037 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-531.5759	0.1339	-71.1780
PV Unit electricity exported	-570.6575	0.1255	-71.6438
Total			-142.8218 (269)
Total CO2, kg/year			880.9101 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.1700 (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	2048.8586	1.1300	2315.2102 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2658.7553	1.1300	3004.3935 (278)
Space and water heating			5319.6037 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	160.7675	1.5338	246.5906 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-531.5759	1.4948	-794.6170
PV Unit electricity exported	-570.6575	0.4608	-262.9729
Total			-1057.5898 (283)
Total Primary energy kWh/year			4638.7052 (286)
Target Primary Energy Rate (TPER)			69.3400 (287)

Full SAP Calculation Printout



Property Reference	Be Lean Boiler				Issued on Date	24/10/2025
Assessment Reference	Flat 4		Prop Type Ref	Baseline		
Property						
SAP Rating	85 B	DER	13.88	TER	12.25	
Environmental	88 B	% DER < TER				-13.31
CO ₂ Emissions (t/year)	1.18	DFEE	29.30	TFEE	38.05	
Compliance Check	See BREL	% DFEE < TFEE				23.01
% DPER < TPER	-19.76	DPER	77.00	TPER	64.29	
Assessor Details	Mr. Neil Bradford				Assessor ID	T704-0001
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)
Main dwelling			
Ground floor	47.2200 (1b)	x 2.4000 (2b)	= 113.3280 (1b) - (3b)
First floor	47.2200 (1c)	x 2.4000 (2c)	= 113.3280 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 226.6560 (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) =	Air changes per hour 20.0000 / (5) = 0.0882 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3382 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2875 (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	0.3666	0.3594	0.3522	0.3163	0.3091	0.2731	0.2731	0.2659	0.2875	0.3091	0.3234	0.3378 (22b)
Effective ac	0.5672	0.5646	0.5620	0.5500	0.5478	0.5373	0.5373	0.5354	0.5413	0.5478	0.5523	0.5571 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			35.9600	0.9615	34.5769		(27)
Solid door			2.1300	1.0000	2.1300		(26a)
GF Ext Wall	58.0100	17.9800	40.0300	0.1300	5.2039	190.0000	7605.6997 (29a)
1F Ext wall	58.0100	17.9800	40.0300	0.1300	5.2039	190.0000	7605.6997 (29a)
GF Exposed Wall	25.6300	2.1300	23.5000	0.1200	2.8200	190.0000	4464.9998 (29a)
1F Exposed Wall	25.6300		25.6300	0.1200	3.0756	190.0000	4869.6998 (29a)
Total net area of external elements Aum(A, m ²)			167.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.0103		(33)
Main dwelling							
Party Wall 1			8.2300	0.0000	0.0000	180.0000	1481.3999 (32)
Party Floor 1			47.2200			40.0000	1888.8000 (32d)
Party Ceiling 1			47.2200			30.0000	1416.6000 (32b)
GF Int Wall			52.1500			9.0000	469.3500 (32c)
1F Int Wall			57.1100			9.0000	513.9900 (32c)
Internal Floor 1			47.2200			18.0000	849.9600 (32d)
Internal Ceiling 1			47.2200			9.0000	424.9800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 31591.1790 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 334.5106 (35)

Full SAP Calculation Printout



List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	18.1400	0.0410	0.7437
E3 Sill	17.1200	0.0060	0.1027
E4 Jamb	54.6000	0.0100	0.5460
E6 Intermediate floor within a dwelling	34.8500	0.0060	0.2091
E7 Party floor between dwellings (in blocks of flats)	34.8500	0.0000	0.0000
E16 Corner (normal)	9.6000	0.0340	0.3264
E18 Party wall between dwellings	9.6000	0.0370	0.3552
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			2.2832 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	55.2935 (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	42.4235	42.2284	42.0371	41.1387	40.9706	40.1881	40.1881	40.0432	40.4895	40.9706	41.3106	41.6661 (38)
Heat transfer coeff	97.7170	97.5218	97.3306	96.4322	96.2641	95.4816	95.4816	95.3367	95.7830	96.2641	96.6041	96.9596 (39)
Average = Sum(39)m / 12 =												96.4314

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0347	1.0326	1.0306	1.0211	1.0193	1.0110	1.0110	1.0095	1.0142	1.0193	1.0229	1.0267 (40)
HLP (average)												1.0211
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6818 (42)
Hot water usage for mixer showers	95.1279	93.6983	91.6151	87.6293	84.6879	81.4077	79.5432	81.6106	83.8769	87.3989	91.4703	94.7634 (42a)	
Hot water usage for baths	29.8746	29.4309	28.8061	27.6541	26.7915	25.8350	25.3183	25.9388	26.6143	27.6378	28.8135	29.7736 (42b)	
Hot water usage for other uses	42.0938	40.5631	39.0325	37.5018	35.9711	34.4404	34.4404	35.9711	37.5018	39.0325	40.5631	42.0938 (42c)	
Average daily hot water use (litres/day)												153.6703 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	167.0963	163.6924	159.4537	152.7852	147.4505	141.6830	139.3019	143.5204	147.9929	154.0691	160.8469	166.6308 (44)	
Energy content (annual)	264.6397	233.0957	245.0744	209.1553	198.4967	174.2158	168.4736	177.7083	182.4901	209.0703	229.1559	260.9036 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2552.4793	
	39.6960	34.9644	36.7612	31.3733	29.7745	26.1324	25.2710	26.6562	27.3735	31.3605	34.3734	39.1355 (46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)	
Total heat required for water heating calculated for each month													
	315.5986	279.1231	296.0333	258.4704	249.4556	223.5309	219.4325	228.6672	231.8051	260.0292	278.4710	311.8625 (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	315.5986	279.1231	296.0333	258.4704	249.4556	223.5309	219.4325	228.6672	231.8051	260.0292	278.4710	311.8625 (64)	
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			3152.4793 (64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
												0.0000 (64a)	
Heat gains from water heating, kWh/month													
	100.7324	89.0112	94.2270	81.8729	78.7399	70.2555	68.7572	71.8277	73.0067	82.2556	88.5231	99.4902 (65)	

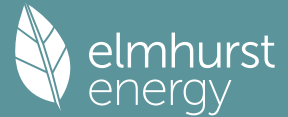
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.5899	137.9388	124.5899	128.7429	124.5899	128.7429	124.5899	124.5899	128.7429	124.5899	128.7429	124.5899 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.0134	249.5766	243.1174	229.3664	212.0083	195.6941	184.7952	182.2320	188.6912	202.4422	219.8003	236.1145 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088 (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)	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701 (71)
Water heating gains (Table 5)	135.3930	132.4571	126.6491	113.7124	105.8332	97.5771	92.4156	96.5426	101.3982	110.5586	122.9488	133.7234 (72)
Total internal gains	573.2226	586.1988	560.5827	538.0480	508.6576	485.2404	465.0269	466.5908	482.0586	503.8170	537.7183	560.6541 (73)

6. Solar gains

[Jan]												
				Area m2	Solar flux Table 6a W/m2			g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W
Northeast				17.6400	11.2829			0.6300	0.0000		0.7700	96.5500 (75)
Southeast				9.1600	36.7938			0.6300	0.0000		0.7700	163.4940 (77)
Northwest				9.1600	11.2829			0.6300	0.0000		0.7700	50.1359 (81)
Solar gains	310.1799	577.0742	918.9955	1355.6033	1716.3861	1791.0666	1690.5354	1408.0603	1068.0925	672.6842	380.3969	259.7079 (83)
Total gains	883.4025	1163.2730	1479.5782	1893.6512	2225.0437	2276.3070	2155.5624	1874.6511	1550.1511	1176.5012	918.1152	820.3619 (84)

Full SAP Calculation Printout



7. Mean internal temperature (heating season)

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

21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	89.8035	89.9832	90.1600	91.0000	91.1589	91.9060	91.9060	92.0456	91.6168	91.1589	90.8380	90.5050
alpha	6.9869	6.9989	7.0107	7.0667	7.0773	7.1271	7.1271	7.1364	7.1078	7.0773	7.0559	7.0337
util living area	0.9937	0.9651	0.8535	0.6083	0.4020	0.2684	0.1949	0.2339	0.4258	0.7954	0.9773	0.9960 (86)
MIT	20.4404	20.6498	20.8542	20.9458	20.9555	20.9563	20.9564	20.9564	20.9556	20.9113	20.6511	20.4006 (87)
Th 2	20.0545	20.0562	20.0579	20.0658	20.0673	20.0742	20.0742	20.0754	20.0715	20.0673	20.0643	20.0612 (88)
util rest of house	0.9911	0.9533	0.8198	0.5640	0.3618	0.2296	0.1539	0.1869	0.3688	0.7418	0.9675	0.9943 (89)
MIT 2	19.5565	19.7596	19.9407	20.0158	20.0231	20.0305	20.0305	20.0318	20.0275	19.9969	19.7710	19.5231 (90)
Living area fraction										fLA = Living area / (4) =		0.3554 (91)
MIT	19.8706	20.0759	20.2653	20.3463	20.3544	20.3595	20.3595	20.3604	20.3573	20.3218	20.0838	19.8349 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8706	20.0759	20.2653	20.3463	20.3544	20.3595	20.3595	20.3604	20.3573	20.3218	20.0838	19.8349 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9905	0.9536	0.8277	0.5775	0.3742	0.2416	0.1665	0.2014	0.3864	0.7572	0.9677	0.9938 (94)
Useful gains	874.9935	1109.2503	1224.6856	1093.5060	832.6099	549.9107	358.9646	377.5683	598.9189	890.8779	888.4890	815.3145 (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	1521.5098	1479.9837	1339.7866	1103.7918	833.1084	549.9274	358.9655	377.5716	599.3477	935.8640	1254.2851	1515.9527 (97)
Space heating kWh	481.0081	249.1329	85.6351	7.4058	0.3709	0.0000	0.0000	0.0000	0.0000	33.4697	263.3732	521.2748 (98a)
Space heating requirement - total per year (kWh/year)												1641.6705
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	481.0081	249.1329	85.6351	7.4058	0.3709	0.0000	0.0000	0.0000	0.0000	33.4697	263.3732	521.2748 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1641.6705
Space heating per m2										(98c) / (4) =		17.3832 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)

0.0000 (201)

Fraction of space heat from main system(s)

1.0000 (202)

Efficiency of main space heating system 1 (in %)

84.0000 (206)

Efficiency of main space heating system 2 (in %)

0.0000 (207)

Efficiency of secondary/supplementary heating system, %

0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	481.0081	249.1329	85.6351	7.4058	0.3709	0.0000	0.0000	0.0000	0.0000	33.4697	263.3732	521.2748 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	572.6287	296.5868	101.9465	8.8164	0.4416	0.0000	0.0000	0.0000	0.0000	39.8449	313.5395	620.5653 (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	315.5986	279.1231	296.0333	258.4704	249.4556	223.5309	219.4325	228.6672	231.8051	260.0292	278.4710	311.8625 (64)
Efficiency of water heater (217)m	80.1878	78.9914	76.8474	75.2245	75.0119	75.0000	75.0000	75.0000	75.0000	75.9277	79.1205	75.0000 (216)
Fuel for water heating, kWh/month	393.5746	353.3587	385.2223	343.5986	332.5545	298.0412	292.5766	304.8896	309.0735	342.4695	351.9581	387.9417 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	30.1696	24.2032	21.7923	15.9660	12.3326	10.0758	11.2502	14.6234	18.9944	24.9216	28.1489	31.0081 (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												1954.3696 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												4095.2588 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

central heating pump

41.0000 (230c)

Total electricity for the above, kWh/year

41.0000 (231)

Electricity for lighting (calculated in Appendix L)

243.4861 (232)

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

PV generation

0.0000 (233)

Wind generation

0.0000 (234)

Full SAP Calculation Printout



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	6334.1145 (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	1954.3696	0.2100	410.4176 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	4095.2588	0.2100	860.0044 (264)
Space and water heating			1270.4220 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	243.4861	0.1443	35.1426 (268)
Total CO2, kg/year			1311.2517 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.8800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1954.3696	1.1300	2208.4377 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4095.2588	1.1300	4627.6425 (278)
Space and water heating			6836.0802 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	243.4861	1.5338	373.4671 (282)
Total Primary energy kWh/year			7271.5720 (286)
Dwelling Primary energy Rate (DPER)			77.0000 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	47.2200 (1b)	x 2.4000 (2b)	= 113.3280 (1b) - (3b)
First floor	47.2200 (1c)	x 2.4000 (2c)	= 113.3280 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	226.6560 (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) = 0.1324 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3824 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3250 (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	0.4144	0.4063	0.3981	0.3575	0.3494	0.3088	0.3088	0.3006	0.3250	0.3494	0.3656	0.3819 (22b)
Effective ac	0.5859	0.5825	0.5793	0.5639	0.5610	0.5477	0.5477	0.5452	0.5528	0.5610	0.5668	0.5729 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Semi-glazed door			2.1300	1.0000	2.1300		(26a)
TER Opening Type			21.5000	1.1450	24.6183		(27)
GF Ext Wall	58.0100	10.7500	47.2600	0.1800	8.5068		(29a)
1F Ext wall	58.0100	10.7500	47.2600	0.1800	8.5068		(29a)

Full SAP Calculation Printout



GF Exposed Wall	25.6300	2.1300	23.5000	0.1800	4.2300	(29a)
1F Exposed Wall	25.6300		25.6300	0.1800	4.6134	(29a)
Total net area of external elements Aum(A, m2)			167.2800			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		52.6053	(33)
Main dwelling						
Party Wall 1		8.2300	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 339.5106 (35)

Length	Psi-value	Total
K1 Element		
E1 Steel lintel with perforated steel base plate	18.1400	0.0500
E3 Sill	17.1200	0.0500
E4 Jamb	54.6000	0.0500
E6 Intermediate floor within a dwelling	34.8500	0.0000
E7 Party floor between dwellings (in blocks of flats)	34.8500	0.0700
E16 Corner (normal)	9.6000	0.0900
E18 Party wall between dwellings	9.6000	0.0600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.3725 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 60.9778 (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	43.8200	43.5706	43.3262	42.1781	41.9633	40.9634	40.9634	40.7782	41.3486	41.9633	42.3979	42.8522 (38)
Heat transfer coeff	104.7978	104.5484	104.3040	103.1559	102.9411	101.9412	101.9412	101.7561	102.3264	102.9411	103.3757	103.8300 (39)
Average = Sum(39)m / 12 =												103.1549

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1097	1.1070	1.1044	1.0923	1.0900	1.0794	1.0794	1.0775	1.0835	1.0900	1.0946	1.0994 (40)
HLP (average)												1.0923
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6818 (42)
Hot water usage for mixer showers												
69.1839	68.1442	66.6292	63.7304	61.5912	59.2056	57.8496	59.3531	61.0014	63.5628	66.5238	68.9189 (42a)	
Hot water usage for baths												
29.8746	29.4309	28.8061	27.6541	26.7915	25.8350	25.3183	25.9388	26.6143	27.6378	28.8135	29.7736 (42b)	
Hot water usage for other uses												
42.0938	40.5631	39.0325	37.5018	35.9711	34.4404	34.4404	35.9711	37.5018	39.0325	40.5631	42.0938 (42c)	
Average daily hot water use (litres/day)												129.7508 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	141.1523	138.1383	134.4677	128.8863	124.3538	119.4810	117.6083	121.2630	125.1174	130.2330	135.9005	140.7863 (44)
Energy conte	223.5508	196.7071	206.6719	176.4389	167.4041	146.9158	142.2371	150.1489	154.2823	176.7250	193.6151	220.4373 (45)
Energy content (annual)										Total = Sum(45)m =		2155.1341
Distribution loss (46)m = 0.15 x (45)m												
33.5326	29.5061	31.0008	26.4658	25.1106	22.0374	21.3356	22.5223	23.1423	26.5087	29.0423	33.0656 (46)	
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
274.5097	242.7345	257.6308	225.7539	218.3630	196.2308	193.1960	201.1078	203.5973	227.6839	242.9302	271.3962 (62)	
WWHRS	-31.6280	-27.9721	-29.2907	-24.2539	-22.6038	-19.3422	-18.1302	-19.2797	-20.0122	-23.5921	-26.7270	-31.0423 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h												
242.8817	214.7624	228.3401	201.5001	195.7592	176.8887	175.0657	181.8281	183.5852	204.0917	216.2032	240.3539 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2461.2599 (64)
Electric shower(s)												2461 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
87.0704	76.9119	81.4581	70.9947	68.4016	61.1783	60.0335	62.6642	63.6276	71.5008	76.7058	86.0351 (65)	

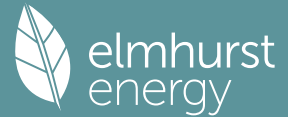
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.5643	137.9105	124.5643	128.7164	124.5643	128.7164	124.5643	124.5643	128.7164	124.5643	128.7164	124.5643 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.0134	249.5766	243.1174	229.3664	212.0083	195.6941	184.7952	182.2320	188.6912	202.4422	219.8003	236.1145 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088 (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)	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701 (71)
Water heating gains (Table 5)	117.0301	114.4523	109.4867	98.6037	91.9376	84.9698	80.6903	84.2261	88.3717	96.1032	106.5358	115.6386 (72)
Total internal gains	554.8340	568.1657	543.3947	522.9129	494.7365	472.6066	453.2760	454.2487	469.0056	489.3360	521.2789	542.5437 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	10.5400	11.2829	0.6300	0.7000	0.7700	36.3442 (75)
Southeast	5.4800	36.7938	0.6300	0.7000	0.7700	61.6208 (77)

Full SAP Calculation Printout



Northwest	5.4800				11.2829				0.6300				0.7000				0.7700				18.8962 (81)			
Solar gains	116.8612	217.4064	346.2022	510.6524	646.5370	674.6597	636.7949	530.4046	402.3604	253.4213	143.3142	97.8466 (83)												
Total gains	671.6952	785.5721	889.5969	1033.5653	1141.2735	1147.2663	1090.0709	984.6533	871.3660	742.7572	664.5931	640.3903 (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	84.9874	85.1901	85.3898	86.3401	86.5203	87.3689	87.3689	87.5279	87.0401	86.5203	86.1566	85.7796												
alpha	6.6658	6.6793	6.6927	6.7560	6.7680	6.8246	6.8246	6.8352	6.8027	6.7680	6.7438	6.7186												
util living area																								
	0.9990	0.9967	0.9880	0.9375	0.7836	0.5634	0.4109	0.4738	0.7647	0.9726	0.9970	0.9992 (86)												
MIT	20.0398	20.1987	20.4359	20.7509	20.9437	20.9946	20.9994	20.9986	20.9645	20.6893	20.3096	20.0159 (87)												
Th 2	19.9929	19.9951	19.9972	20.0071	20.0090	20.0177	20.0177	20.0193	20.0143	20.0090	20.0052	20.0013 (88)												
util rest of house																								
	0.9985	0.9952	0.9824	0.9113	0.7196	0.4797	0.3195	0.3737	0.6757	0.9557	0.9954	0.9989 (89)												
MIT 2	18.8810	19.0855	19.3872	19.7738	19.9700	20.0154	20.0176	20.0190	19.9955	19.7128	19.2357	18.8568 (90)												
Living area fraction																								
	0.9985	0.9952	0.9824	0.9113	0.7196	0.4797	0.3195	0.3737	0.6757	0.9557	0.9954	0.9989 (89)												
MIT	19.2928	19.4811	19.7599	20.1210	20.3160	20.3634	20.3665	20.3671	20.3398	20.0598	19.6173	19.2687 (92)												
Temperature adjustment												0.0000												
adjusted MIT	19.2928	19.4811	19.7599	20.1210	20.3160	20.3634	20.3665	20.3671	20.3398	20.0598	19.6173	19.2687 (93)												

8. Space heating requirement																								

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec												
Utilisation	0.9980	0.9942	0.9807	0.9148	0.7406	0.5095	0.3520	0.4094	0.7069	0.9568	0.9945	0.9985 (94)												
Useful gains	670.3602	780.9992	872.4654	945.4813	845.1705	584.5325	383.7585	403.1383	615.9257	710.6585	660.9575	639.4534 (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	1571.2115	1524.4307	1383.0600	1157.5148	886.9432	587.5260	383.9595	403.6758	638.5004	973.8025	1293.9855	1564.5801 (97)												
Space heating kWh	670.2333	499.5859	379.8824	152.6642	31.0789	0.0000	0.0000	0.0000	0.0000	195.7792	455.7802	688.2943 (98a)												
Space heating requirement - total per year (kWh/year)												3073.2984												
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	670.2333	499.5859	379.8824	152.6642	31.0789	0.0000	0.0000	0.0000	0.0000	195.7792	455.7802	688.2943 (98c)												
Space heating requirement after solar contribution - total per year (kWh/year)												3073.2984												
Space heating per m2												(98c) / (4) =	32.5423 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)												
Fraction of space heat from main system(s)												1.0000 (202)												
Efficiency of main space heating system 1 (in %)												92.4000 (206)												
Efficiency of main space heating system 2 (in %)												0.0000 (207)												
Efficiency of secondary/supplementary heating system, %												0.0000 (208)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec												
Space heating requirement	670.2333	499.5859	379.8824	152.6642	31.0789	0.0000	0.0000	0.0000	0.0000	195.7792	455.7802	688.2943 (98)												
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)												
Space heating fuel (main heating system)	725.3607	540.6774	411.1281	165.2210	33.6351	0.0000	0.0000	0.0000	0.0000	211.8822	493.2686	744.9073 (211)												
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)												
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)												
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)												
Water heating																								
Water heating requirement	242.8817	214.7624	228.3401	201.5001	195.7592	176.8887	175.0657	181.8281	183.5852	204.0917	216.2032	240.3539 (64)												
Efficiency of water heater												80.3000 (216)												
(217)m	86.4376	86.1269	85.4638	83.7942	81.3786	80.3000	80.3000	80.3000	80.3000	84.2924	85.9387	86.5022 (217)												
Fuel for water heating, kWh/month																								
	280.9907	249.3558	267.1777	240.4703	240.5537	220.2847	218.0146	226.4360	228.6241	242.1236	251.5782	277.8586 (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	25.8820	20.7635	18.6952	13.6969	10.5799	8.6439	9.6513	12.5452	16.2949	21.3798	24.1485	26.6013 (232)												
Electricity generated by PVs (Appendix M) (negative quantity)																								
(233a)m	-31.5759	-45.6650	-67.3095	-77.6584	-85.4217	-80.3140	-79.2971	-74.0150	-65.0010	-53.0703	-35.1087	-27.1642 (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	-14.5171	-30.8643	-61.9597	-93.9715	-125.1589	-126.1108	-124.6583	-105.1622	-76.5515	-44.4761	-19.4888	-11.4580 (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												3326.0805 (211)												
Space heating fuel - main system 2												0.0000 (213)												
Space heating fuel - secondary												0.0000 (215)												
Efficiency of water heater												80.3000												
Water heating fuel used												2943.4682 (219)												
Space cooling fuel												0.0000 (221)												

Full SAP Calculation Printout



Electricity for pumps and fans:	86.0000 (231)
Total electricity for the above, kWh/year	
Electricity for lighting (calculated in Appendix L)	208.8826 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1555.9779 (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	5008.4534 (238)

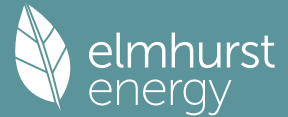
----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3326.0805	0.2100	698.4769 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2943.4682	0.2100	618.1283 (264)
Space and water heating			1316.6052 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	208.8826	0.1443	30.1482 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-721.6008	0.1341	-96.7386
PV Unit electricity exported	-834.3771	0.1256	-104.8012
Total			-201.5399 (269)
Total CO2, kg/year			1157.1428 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2500 (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	3326.0805	1.1300	3758.4710 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2943.4682	1.1300	3326.1191 (278)
Space and water heating			7084.5901 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	208.8826	1.5338	320.3911 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-721.6008	1.4954	-1079.1091
PV Unit electricity exported	-834.3771	0.4610	-384.6807
Total			-1463.7898 (283)
Total Primary energy kWh/year			6071.2921 (286)
Target Primary Energy Rate (TPER)			64.2900 (287)

Full SAP Calculation Printout



Property Reference	Be Lean Boiler				Issued on Date	24/10/2025
Assessment Reference	Flat 5		Prop Type Ref	Baseline		
Property						
SAP Rating	86 B	DER	13.32	TER	11.36	
Environmental	89 B	% DER < TER				-17.25
CO ₂ Emissions (t/year)	0.95	DFEE	19.83	TFEE	29.48	
Compliance Check	See BREL	% DFEE < TFEE				32.73
% DPER < TPER	-24.00	DPER	73.83	TPER	59.54	
Assessor Details	Mr. Neil Bradford				Assessor ID	T704-0001
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)
Main dwelling			
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.5000		183.6000 (1b) - (3b)
Dwelling volume			183.6000 (5)

2. Ventilation rate

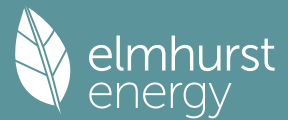
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1089 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3589 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3051 (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	0.3890	0.3814	0.3737	0.3356	0.3280	0.2898	0.2898	0.2822	0.3051	0.3280	0.3432	0.3585 (22b)
Effective ac	0.5757	0.5727	0.5698	0.5563	0.5538	0.5420	0.5420	0.5398	0.5465	0.5538	0.5589	0.5643 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			22.0500	0.9615	21.2019		(27)
Solid door			2.1300	1.0000	2.1300		(26a)
Heatloss Floor 1			67.7500	0.0900	6.0975	110.0000	7452.5000 (28a)
External Wall 1	50.9000	22.0500	28.8500	0.1300	3.7505	190.0000	5481.5003 (29a)
Corridor Wall	17.4000	2.1300	15.2700	0.1200	1.8324	190.0000	2901.2999 (29a)
Total net area of external elements Aum(A, m ²)			136.0500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 35.0123		(33)
Main dwelling							
Party Wall 1			24.2600	0.0000	0.0000	180.0000	4366.8000 (32)
Party Floor 1			76.5000			40.0000	3060.0000 (32d)
Party Ceiling 1			76.5000			30.0000	2295.0000 (32b)
Internal Wall 1			101.0400			9.0000	909.3600 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26466.4603 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							345.9668 (35)
List of Thermal Bridges							
K1 Element					Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate					11.5100	0.0410	0.4719
E3 Sill					10.5000	0.0060	0.0630
E4 Jamb					25.2000	0.0100	0.2520

Full SAP Calculation Printout



E7 Party floor between dwellings (in blocks of flats)	32.3000	0.0000	0.0000	
E16 Corner (normal)	4.8000	0.0340	0.1632	
E18 Party wall between dwellings	4.8000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				0.9501 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		35.9624 (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	34.8780	34.7000	34.5255	33.7060	33.5526	32.8389	32.8389	32.7067	33.1138	33.5526	33.8628	34.1871	(38)
Heat transfer coeff	70.8404	70.6624	70.4879	69.6684	69.5151	68.8013	68.8013	68.6691	69.0762	69.5151	69.8253	70.1495	(39)
Average = Sum(39)m / 12 =												69.6677	
HLP	0.9260	0.9237	0.9214	0.9107	0.9087	0.8994	0.8994	0.8976	0.9030	0.9087	0.9127	0.9170	(40)
HLP (average)												0.9107	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3931 (42)
Hot water usage for mixer showers													
88.4731	87.1435	85.2061	81.4991	78.7634	75.7127	73.9786	75.9014	78.0091	81.2847	85.0713	88.1341	(42a)	
Hot water usage for baths													
27.7933	27.3805	26.7992	25.7275	24.9250	24.0351	23.5545	24.1317	24.7601	25.7123	26.8061	27.6993	(42b)	
Hot water usage for other uses													
39.1377	37.7145	36.2913	34.8682	33.4450	32.0218	32.0218	33.4450	34.8682	36.2913	37.7145	39.1377	(42c)	
Average daily hot water use (litres/day)												142.9177	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
155.4041	152.2386	148.2967	142.0947	137.1334	131.7696	129.5548	133.4780	137.6374	143.2884	149.5920	154.9712	(44)	
Energy content (annual)	246.1221	216.7857	227.9264	194.5206	184.6079	162.0261	156.6854	165.2737	169.7207	194.4410	213.1212	242.6474	(45)
Distribution loss (46)m = 0.15 x (45)m													
36.9183	32.5179	34.1890	29.1781	27.6912	24.3039	23.5028	24.7911	25.4581	29.1662	31.9682	36.3971	(46)	
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
297.0810	262.8131	278.8853	243.8357	235.5668	211.3411	207.6443	216.2326	219.0358	245.3999	262.4363	293.6063	(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													
297.0810	262.8131	278.8853	243.8357	235.5668	211.3411	207.6443	216.2326	219.0358	245.3999	262.4363	293.6063	(64)	
12Total per year (kWh/year)												2974	(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	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													
94.5753	83.5881	88.5253	77.0069	74.1219	66.2024	64.8376	67.6932	68.7609	77.3914	83.1916	93.4200	(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	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.9148	118.3699	106.9148	110.4786	106.9148	110.4786	106.9148	106.9148	110.4786	106.9148	110.4786	106.9148 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	211.9705	214.1701	208.6272	196.8270	181.9314	167.9317	158.5790	156.3794	161.9223	173.7225	188.6181	202.6178 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655 (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)	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239 (71)
Water heating gains (Table 5)	127.1174	124.3870	118.9856	106.9540	99.6261	91.9478	87.1473	90.9855	95.5013	104.0206	115.5439	125.5645 (72)
Total internal gains	507.8992	518.8236	496.4241	476.1561	450.3689	429.2546	411.5376	413.1762	426.7986	446.5544	476.5370	496.9936 (73)

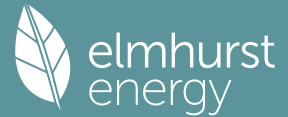
6. Solar gains

[Jan]				Area	Solar flux		g	FF		Access	Gains	
				m2	Table 6a			Specific data		factor	W	
					W/m2			or Table 6b		Table 6d		
								or Table 6c				
Northeast				4.4100	11.2829		0.6300		0.0000	0.7700	24.1375 (75)	
Southeast				8.8200	36.7938		0.6300		0.0000	0.7700	157.4254 (77)	
Southwest				8.8200	36.7938		0.6300		0.0000	0.7700	157.4254 (79)	
Solar gains	338.9884	585.4401	822.3206	1054.5903	1213.8099	1219.3635	1169.6326	1048.6566	902.4140	652.7779	407.4900	289.1586 (83)
Total gains	846.8875	1104.2636	1318.7446	1530.7464	1664.1788	1648.6181	1581.1701	1461.8327	1329.2126	1099.3323	884.0270	786.1522 (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		

Full SAP Calculation Printout



tau	103.7797	104.0411	104.2987	105.5255	105.7583	106.8554	106.8554	107.0611	106.4301	105.7583	105.2885	104.8018
alpha	7.9186	7.9361	7.9532	8.0350	8.0506	8.1237	8.1237	8.1374	8.0953	8.0506	8.0192	7.9868
util living area	0.9788	0.9009	0.7495	0.5486	0.3884	0.2671	0.1915	0.2161	0.3585	0.6497	0.9259	0.9865 (86)
MIT	20.6660	20.8418	20.9328	20.9586	20.9612	20.9617	20.9617	20.9617	20.9615	20.9541	20.8344	20.6252 (87)
Th 2	20.1454	20.1474	20.1493	20.1584	20.1601	20.1680	20.1680	20.1695	20.1650	20.1601	20.1567	20.1531 (88)
util rest of house	0.9713	0.8769	0.7125	0.5112	0.3533	0.2324	0.1553	0.1771	0.3152	0.6003	0.9023	0.9815 (89)
MIT 2	19.8565	20.0173	20.0914	20.1182	20.1214	20.1297	20.1297	20.1312	20.1265	20.1176	20.0228	19.8245 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	20.1595	20.3260	20.4064	20.4328	20.4358	20.4412	20.4412	20.4422	20.4391	20.4308	20.3266	20.1243 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1595	20.3260	20.4064	20.4328	20.4358	20.4412	20.4412	20.4422	20.4391	20.4308	20.3266	20.1243 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9714	0.8823	0.7239	0.5235	0.3648	0.2438	0.1671	0.1899	0.3294	0.6164	0.9076	0.9813 (94)
Useful gains	822.7028	974.2374	954.6630	801.3172	607.1528	401.8778	264.2784	277.5719	437.8449	677.6799	802.3031	771.4483 (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	1123.4964	1090.0377	980.2337	803.4739	607.2681	401.8810	264.2786	277.5722	437.8815	683.3862	923.5535	1117.0798 (97)
Space heating kWh	223.7904	77.8178	19.0246	1.5528	0.0857	0.0000	0.0000	0.0000	0.0000	4.2455	87.3003	257.1498 (98a)
Space heating requirement - total per year (kWh/year)												670.9670
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	223.7904	77.8178	19.0246	1.5528	0.0857	0.0000	0.0000	0.0000	0.0000	4.2455	87.3003	257.1498 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												670.9670
Space heating per m2										(98c) / (4) =		8.7708 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												84.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	223.7904	77.8178	19.0246	1.5528	0.0857	0.0000	0.0000	0.0000	0.0000	4.2455	87.3003	257.1498 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	266.4172	92.6403	22.6484	1.8486	0.1021	0.0000	0.0000	0.0000	0.0000	5.0541	103.9289	306.1308 (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	297.0810	262.8131	278.8853	243.8357	235.5668	211.3411	207.6443	216.2326	219.0358	245.3999	262.4363	293.6063 (64)
Efficiency of water heater (217)m	78.6191	76.8818	75.5167	75.0509	75.0029	75.0000	75.0000	75.0000	75.0000	75.1369	77.0610	75.0000 (216)
Fuel for water heating, kWh/month	377.8738	341.8403	369.3029	324.8938	314.0768	281.7882	276.8590	288.3101	292.0477	326.6037	340.5567	371.8914 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	21.7607	17.4573	15.7183	11.5159	8.8952	7.2675	8.1145	10.5476	13.7002	17.9755	20.3032	22.3655 (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												798.7703 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												3906.0444 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												175.6215 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												4921.4362 (238)

Full SAP Calculation Printout



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	798.7703	0.2100	167.7418 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3906.0444	0.2100	820.2693 (264)
Space and water heating			988.0111 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	175.6215	0.1443	25.3476 (268)
Total CO2, kg/year			1019.0459 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.3200 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	798.7703	1.1300	902.6104 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3906.0444	1.1300	4413.8302 (278)
Space and water heating			5316.4406 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	175.6215	1.5338	269.3741 (282)
Total Primary energy kWh/year			5647.8395 (286)
Dwelling Primary energy Rate (DPER)			73.8300 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	76.5000 (1b)	x 2.4000 (2b)	= 183.6000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	183.6000 (5)

2. Ventilation rate

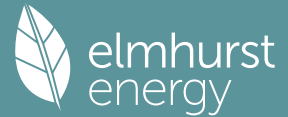
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1634 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4134 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3514 (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	0.4480	0.4392	0.4305	0.3865	0.3777	0.3338	0.3338	0.3250	0.3514	0.3777	0.3953	0.4129 (22b)
Effective ac	0.6004	0.5965	0.5926	0.5747	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Semi-glazed door			2.1300	1.0000	2.1300		(26a)
TER Opening Type			17.0000	1.1450	19.4656		(27)
Heatloss Floor 1			67.7500	0.1300	8.8075		(28a)
External Wall 1	50.9000	17.0000	33.9000	0.1800	6.1020		(29a)
Corridor Wall	17.4000	2.1300	15.2700	0.1800	2.7486		(29a)
Total net area of external elements Aum(A, m2)			136.0500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.2537		(33)
Main dwelling							
Party Wall 1			24.2600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							355.9668 (35)

Full SAP Calculation Printout



List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	11.5100	0.0500	0.5755
E3 Sill	10.5000	0.0500	0.5250
E4 Jamb	25.2000	0.0500	1.2600
E7 Party floor between dwellings (in blocks of flats)	32.3000	0.0700	2.2610
E16 Corner (normal)	4.8000	0.0900	0.4320
E18 Party wall between dwellings	4.8000	0.0600	0.2880
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.3415 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	44.5952 (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	36.3747	36.1386	35.9071	34.8200	34.6166	33.6698	33.6698	33.4945	34.0345	34.6166	35.0281	35.4583 (38)
Heat transfer coeff	80.9699	80.7338	80.5024	79.4153	79.2119	78.2651	78.2651	78.0897	78.6298	79.2119	79.6234	80.0535 (39)
Average = Sum(39)m / 12 =												79.4143
HLP	1.0584	1.0553	1.0523	1.0381	1.0354	1.0231	1.0231	1.0208	1.0278	1.0354	1.0408	1.0465 (40)
HLP (average)												1.0381
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3931 (42)
Hot water usage for mixer showers													
64.3441	63.3771	61.9681	59.2721	57.2825	55.0638	53.8026	55.2010	56.7339	59.1162	61.8701	64.0976 (42a)		
Hot water usage for baths													
27.7933	27.3805	26.7992	25.7275	24.9250	24.0351	23.5545	24.1317	24.7601	25.7123	26.8061	27.6993 (42b)		
Hot water usage for other uses													
39.1377	37.7145	36.2913	34.8682	33.4450	32.0218	32.0218	33.4450	34.8682	36.2913	37.7145	39.1377 (42c)		
Average daily hot water use (litres/day)													120.6716 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	131.2751	128.4722	125.0586	119.8677	115.6525	111.1207	109.3789	112.7776	116.3622	121.1198	126.3907	130.9346 (44)	
Energy content	207.9076	182.9426	192.2105	164.0929	155.6904	136.6358	132.2843	139.6423	143.4862	164.3585	180.0668	205.0119 (45)	
Energy content (annual)										Total = Sum(45)m =		2004.3299	
Distribution loss (46)m = 0.15 x (45)m													
31.1861	27.4414	28.8316	24.6139	23.3536	20.4954	19.8426	20.9463	21.5229	24.6538	27.0100	30.7518 (46)		
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)	
Total heat required for water heating calculated for each month													
258.8665	228.9700	243.1694	213.4080	206.6493	185.9509	183.2432	190.6012	192.8013	215.3174	229.3818	255.9708 (62)		
WWHRS	-29.4154	-26.0152	-27.2417	-22.5572	-21.0225	-17.9891	-16.8619	-17.9309	-18.6122	-21.9417	-24.8573	-28.8707 (63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	229.4511	202.9548	215.9277	190.8508	185.6269	167.9618	166.3813	172.6703	174.1891	193.3756	204.5245	227.1001 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2331.0140 (64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
												0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month													
81.8690	72.3353	76.6497	66.8897	64.5068	57.7602	56.7242	59.1708	60.0379	67.3889	72.2010	80.9062 (65)		

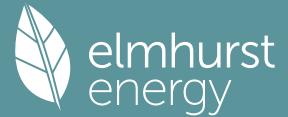
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.9223	118.3782	106.9223	110.4863	106.9223	110.4863	106.9223	106.9223	110.4863	106.9223	110.4863	106.9223 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	211.9705	214.1701	208.6272	196.8270	181.9314	167.9317	158.5790	156.3794	161.9223	173.7225	188.6181	202.6178 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655 (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)	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239 (71)
Water heating gains (Table 5)	110.0390	107.6418	103.0238	92.9023	86.7027	80.2225	76.2423	79.5306	83.3860	90.5765	100.2791	108.7449 (72)
Total internal gains	490.8283	502.0866	480.4698	462.1122	437.4529	417.5370	400.6400	401.7287	414.6911	433.1177	461.2800	480.1814 (73)

6. Solar gains

[Jan]												
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W	
Northeast				3.4000	11.2829		0.6300	0.7000		0.7700	11.7239 (75)	
Southeast				6.8000	36.7938		0.6300	0.7000		0.7700	76.4638 (77)	
Southwest				6.8000	36.7938		0.6300	0.7000		0.7700	76.4638 (79)	
Solar gains	164.6515	284.3566	399.4128	512.2296	589.5648	592.2623	568.1072	509.3475	438.3154	317.0636	197.9237	140.4485 (83)
Total gains	655.4797	786.4432	879.8826	974.3417	1027.0177	1009.7992	968.7472	911.0762	853.0065	750.1813	659.2037	620.6299 (84)

Full SAP Calculation Printout



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	93.4210	93.6942	93.9636	95.2499	95.4944	96.6497	96.6497	96.8667	96.2014	95.4944	95.0010	94.4905
alpha	7.2281	7.2463	7.2642	7.3500	7.3663	7.4433	7.4433	7.4578	7.4134	7.3663	7.3334	7.2994
util living area	0.9972	0.9895	0.9650	0.8740	0.6986	0.4947	0.3554	0.3940	0.6278	0.9174	0.9908	0.9981 (86)
MIT	20.2576	20.4453	20.6615	20.8835	20.9795	20.9985	20.9999	20.9998	20.9925	20.8555	20.5167	20.2277 (87)
Th 2	20.0349	20.0375	20.0400	20.0517	20.0539	20.0642	20.0642	20.0661	20.0602	20.0539	20.0494	20.0448 (88)
util rest of house	0.9960	0.9850	0.9510	0.8343	0.6351	0.4231	0.2799	0.3142	0.5465	0.8797	0.9861	0.9972 (89)
MIT 2	19.1877	19.4269	19.6943	19.9522	20.0409	20.0636	20.0641	20.0660	20.0568	19.9322	19.5285	19.1575 (90)
Living area fraction									fLA = Living area / (4) =			0.3744 (91)
MIT	19.5882	19.8082	20.0564	20.3008	20.3923	20.4136	20.4145	20.4156	20.4071	20.2779	19.8985	19.5581 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5882	19.8082	20.0564	20.3008	20.3923	20.4136	20.4145	20.4156	20.4071	20.2779	19.8985	19.5581 (93)

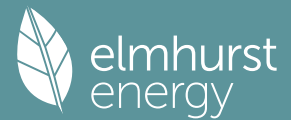
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9952	0.9836	0.9512	0.8456	0.6584	0.4499	0.3081	0.3441	0.5770	0.8898	0.9851	0.9966 (94)
Useful gains	652.3493	773.5766	836.9804	823.8642	676.1671	454.3399	298.5066	313.5040	492.1598	667.4989	649.4022	618.5308 (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	1237.8885	1203.5960	1091.3212	905.4017	688.5351	455.0028	298.5390	313.5762	495.9238	766.6018	1019.0572	1229.4734 (97)
Space heating kWh	435.6412	288.9730	189.2296	58.7070	9.2018	0.0000	0.0000	0.0000	0.0000	73.7326	266.1516	454.5413 (98a)
Space heating requirement - total per year (kWh/year)												1776.1781
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	435.6412	288.9730	189.2296	58.7070	9.2018	0.0000	0.0000	0.0000	0.0000	73.7326	266.1516	454.5413 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1776.1781
Space heating per m2										(98c) / (4) =		23.2180 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	435.6412	288.9730	189.2296	58.7070	9.2018	0.0000	0.0000	0.0000	0.0000	73.7326	266.1516	454.5413 (98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)	
Space heating fuel (main heating system)	471.4731	312.7414	204.7939	63.5358	9.9587	0.0000	0.0000	0.0000	0.0000	79.7972	288.0428	491.9278 (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	229.4511	202.9548	215.9277	190.8508	185.6269	167.9618	166.3813	172.6703	174.1891	193.3756	204.5245	227.1001 (64)	
Efficiency of water heater (217)m	85.7324	85.1381	84.0998	82.1699	80.6686	80.3000	80.3000	80.3000	80.3000	82.5031	84.9468	85.8372 (217)	
Fuel for water heating, kWh/month	267.6365	238.3830	256.7519	232.2635	230.1105	209.1679	207.1996	215.0314	216.9229	234.3858	240.7679	264.5708 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)	
Lighting	22.2163	17.8228	16.0474	11.7570	9.0815	7.4196	8.2844	10.7684	13.9871	18.3518	20.7283	22.8338 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-25.9106	-37.6493	-55.7603	-64.6630	-71.4281	-67.2862	-66.4555	-61.8937	-54.1360	-43.9202	-28.8789	-22.2719 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	-11.4264	-24.3424	-48.9526	-74.3637	-99.1502	-99.9258	-98.7562	-83.2467	-60.5269	-35.0961	-15.3472	-9.0136 (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													1922.2706 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													2813.1918 (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)													179.2985 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1260.4014 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)

Full SAP Calculation Printout



Appendix Q - special features
 Energy saved or generated
 Energy used
 Total delivered energy for all uses

-0.0000 (236)
 0.0000 (237)
 3740.3595 (238)

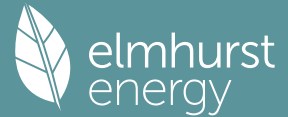
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1922.2706	0.2100	403.6768 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2813.1918	0.2100	590.7703 (264)
Space and water heating			994.4471 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	179.2985	0.1443	25.8783 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-600.2537	0.1340	-80.4057
PV Unit electricity exported	-660.1476	0.1256	-82.8896
Total			-163.2953 (269)
Total CO2, kg/year			868.9594 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3600 (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	1922.2706	1.1300	2172.1658 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2813.1918	1.1300	3178.9067 (278)
Space and water heating			5351.0725 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	179.2985	1.5338	275.0141 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-600.2537	1.4950	-897.3983
PV Unit electricity exported	-660.1476	0.4609	-304.2512
Total			-1201.6495 (283)
Total Primary energy kWh/year			4554.5379 (286)
Target Primary Energy Rate (TPER)			59.5400 (287)

Full SAP Calculation Printout



Property Reference	Be Lean Boiler				Issued on Date	24/10/2025
Assessment Reference	Flat 6		Prop Type Ref	Baseline		
Property						
SAP Rating	86 B	DER	12.31	TER	11.60	
Environmental	90 B	% DER < TER				-6.12
CO ₂ Emissions (t/year)	0.75	DFEE	19.82	TFEE	27.04	
Compliance Check	See BREL	% DFEE < TFEE				26.69
% DPER < TPER	-12.74	DPER	68.63	TPER	60.88	
Assessor Details	Mr. Neil Bradford				Assessor ID	T704-0001
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)
Main dwelling			
Ground floor	66.9000 (1b)	2.4000 (2b)	160.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9000		160.5600 (4)
Dwelling volume			160.5600 (5)

2. Ventilation rate

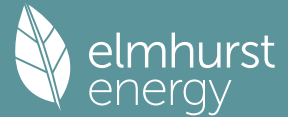
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1246 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3746 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3184 (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	0.4059	0.3980	0.3900	0.3502	0.3423	0.3025	0.3025	0.2945	0.3184	0.3423	0.3582	0.3741 (22b)
Effective ac	0.5824	0.5792	0.5761	0.5613	0.5586	0.5457	0.5457	0.5434	0.5507	0.5586	0.5641	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			17.4300	0.9615	16.7596		(27)
Solid door			2.1300	1.0000	2.1300		(26a)
External Wall 1	49.4600	17.4300	32.0300	0.1300	4.1639	190.0000	6085.6998 (29a)
Corridor Wall	14.8200	2.1300	12.6900	0.1200	1.5228	190.0000	2411.0999 (29a)
Total net area of external elements Aum(A, m ²)			64.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.5763		(33)
Main dwelling							
Party Wall 1			21.1100	0.0000	0.0000	180.0000	3799.8001 (32)
Party Floor 1			66.9000			40.0000	2676.0000 (32d)
Party Ceiling 1			66.9000			30.0000	2007.0000 (32b)
Internal Wall 1			77.6900			9.0000	699.2100 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	17678.8099 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							264.2572 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				10.1100	0.0410	0.4145	
E3 Sill				9.1000	0.0060	0.0546	
E4 Jamb				23.1000	0.0100	0.2310	
E7 Party floor between dwellings (in blocks of flats)				31.4500	0.0000	0.0000	

Full SAP Calculation Printout



E16 Corner (normal)												
E18 Party wall between dwellings												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												
Point Thermal bridges												
Total fabric heat loss												
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	30.8579	30.6884	30.5222	29.7418	29.5957	28.9160	28.9160	28.7901	29.1778	29.5957	29.8911	30.2000 (38)
Average = Sum(39)m / 12 =	56.2975	56.1280	55.9618	55.1814	55.0354	54.3556	54.3556	54.2297	54.6174	55.0354	55.3308	55.6396 (39)
												55.1807
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8415	0.8390	0.8365	0.8248	0.8227	0.8125	0.8125	0.8106	0.8164	0.8227	0.8271	0.8317 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

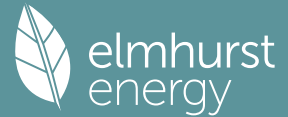
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.1686 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths												
69.8296	68.7925	67.3321	64.6394	62.6231	60.3874	59.1797	60.6299	62.2089	64.6012	67.3494	69.5935	(42b)
Hot water usage for other uses												
36.8384	35.4988	34.1592	32.8197	31.4801	30.1405	30.1405	31.4801	32.8197	34.1592	35.4988	36.8384	(42c)
Average daily hot water use (litres/day)												98.2325 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	106.6680	104.2914	101.4914	97.4591	94.1032	90.5279	89.3202	92.1100	95.0286	98.7605	102.8482	106.4319 (44)
Energy conte	168.9360	148.5095	155.9885	133.4166	126.6810	111.3146	108.0251	114.0514	117.1798	134.0170	146.5262	166.6467 (45)
Energy content (annual)												Total = Sum(45)m = 1631.2924
Distribution loss (46)m = 0.15 x (45)m												
25.3404	22.2764	23.3983	20.0125	19.0021	16.6972	16.2038	17.1077	17.5770	20.1026	21.9789	24.9970	(46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.0620	47.9540	44.6439	45.5166	46.9383	46.8634	50.3273	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
219.8949	194.5369	206.9474	181.4786	174.6350	155.9585	153.5417	160.9897	164.0432	184.3443	195.8413	217.6056	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	219.8949	194.5369	206.9474	181.4786	174.6350	155.9585	153.5417	160.9897	164.0432	184.3443	195.8413	217.6056 (64)
12Total per year (kWh/year)												2209.8169 (64)
Electric shower(s)												2210 (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												
68.9110	60.8863	64.6059	56.3765	54.1099	48.1731	47.2975	49.6567	50.6781	57.1425	61.0487	68.1497	(65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
95.8113	106.0767	95.8113	99.0050	95.8113	99.0050	95.8113	95.8113	99.0050	95.8113	99.0050	95.8113	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
189.9565	191.9277	186.9604	176.3858	163.0371	150.4913	142.1099	140.1388	145.1060	155.6807	169.0293	181.5751	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	(71)
Water heating gains (Table 5)												
92.6223	90.6046	86.8359	78.3007	72.7284	66.9070	63.5719	66.7428	70.3863	76.8044	84.7899	91.5991	(72)
Total internal gains	436.9187	447.1377	428.1362	412.2201	390.1054	371.9320	357.0217	358.2215	370.0259	386.8250	411.3528	427.5142 (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							
Northeast	2.5200	11.2829	0.6300	0.0000	0.7700	13.7929 (75)						
Southwest	6.0900	36.7938	0.6300	0.0000	0.7700	108.6985 (79)						
Northwest	8.8200	11.2829	0.6300	0.0000	0.7700	48.2750 (81)						
Solar gains	170.7664	311.4947	480.9616	687.7224	854.0859	884.7614	837.6684	707.9197	551.6747	359.0330	208.2932	143.7110 (83)
Total gains	607.6851	758.6323	909.0978	1099.9425	1244.1914	1256.6934	1194.6901	1066.1413	921.7006	745.8580	619.6460	571.2252 (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
	87.2291	87.4925	87.7523	88.9934	89.2296	90.3454	90.3454	90.5551	89.9123	89.2296	88.7532	88.2606

Full SAP Calculation Printout



alpha	6.8153	6.8328	6.8502	6.9329	6.9486	7.0230	7.0230	7.0370	6.9942	6.9486	6.9169	6.8840
util living area	0.9813	0.9349	0.8180	0.5994	0.4109	0.2768	0.2002	0.2340	0.4084	0.7351	0.9468	0.9866 (86)
MIT	20.5365	20.7181	20.8721	20.9449	20.9545	20.9557	20.9557	20.9558	20.9550	20.9259	20.7328	20.5030 (87)
Th 2	20.2175	20.2197	20.2218	20.2319	20.2337	20.2425	20.2425	20.2441	20.2391	20.2337	20.2299	20.2260 (88)
util rest of house	0.9760	0.9200	0.7885	0.5635	0.3772	0.2440	0.1657	0.1955	0.3636	0.6903	0.9317	0.9827 (89)
MIT 2	19.8037	19.9773	20.1143	20.1804	20.1886	20.1982	20.1982	20.2000	20.1945	20.1703	20.0032	19.7786 (90)
Living area fraction	20.1506	20.3280	20.4730	20.5423	20.5512	20.5568	20.5568	20.5578	20.5545	20.5280	20.3486	0.4734 (91)
MIT	20.1506	20.3280	20.4730	20.5423	20.5512	20.5568	20.5568	20.5578	20.5545	20.5280	20.3486	20.1215 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1506	20.3280	20.4730	20.5423	20.5512	20.5568	20.5568	20.5578	20.5545	20.5280	20.3486	20.1215 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9755	0.9222	0.7983	0.5781	0.3912	0.2576	0.1800	0.2115	0.3822	0.7080	0.9342	0.9821 (94)
Useful gains	592.8112	699.6302	725.7744	635.9239	486.6880	323.7684	215.0749	225.4717	352.2664	528.0326	578.9001	561.0087 (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	892.3497	865.9423	781.9565	642.4387	487.1269	323.7859	215.0760	225.4748	352.5286	546.3907	733.0536	885.8675 (97)
Space heating kWh	222.8566	111.7618	41.7995	4.6906	0.3265	0.0000	0.0000	0.0000	0.0000	13.6584	110.9905	241.6949 (98a)
Space heating requirement - total per year (kWh/year)												747.7789
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	222.8566	111.7618	41.7995	4.6906	0.3265	0.0000	0.0000	0.0000	0.0000	13.6584	110.9905	241.6949 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												747.7789
Space heating per m2										(98c) / (4) =		11.1776 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												84.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	222.8566	111.7618	41.7995	4.6906	0.3265	0.0000	0.0000	0.0000	0.0000	13.6584	110.9905	241.6949 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	265.3055	133.0497	49.7613	5.5841	0.3887	0.0000	0.0000	0.0000	0.0000	16.2600	132.1316	287.7321 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating

Water heating requirement	219.8949	194.5369	206.9474	181.4786	174.6350	155.9585	153.5417	160.9897	164.0432	184.3443	195.8413	217.6056 (64)
Efficiency of water heater (217)m	79.2753	78.0513	76.3751	75.2030	75.0150	75.0000	75.0000	75.0000	75.0000	75.5584	78.0240	75.0000 (216)
Fuel for water heating, kWh/month	277.3814	249.2422	270.9619	241.3182	232.8000	207.9446	204.7223	214.6529	218.7242	243.9758	251.0014	79.4812 (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	273.7823 (219)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	0.0000 (221)
Lighting	21.1589	16.9745	15.2836	11.1974	8.6492	7.0665	7.8901	10.2559	13.3214	17.4783	19.7418	3.4822 (231)
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	21.7470 (232)
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 (233a)
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 (234a)
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 (235a)
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 (235a)
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 (235a)
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 (235a)
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												890.2130 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												2886.5074 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												170.7646 (232)

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

PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												3988.4850 (238)

Full SAP Calculation Printout



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	890.2130	0.2100	186.9447 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2886.5074	0.2100	606.1665 (264)
Space and water heating			793.1113 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	170.7646	0.1443	24.6466 (268)
Total CO2, kg/year			823.4451 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.3100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	890.2130	1.1300	1005.9407 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2886.5074	1.1300	3261.7533 (278)
Space and water heating			4267.6940 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	170.7646	1.5338	261.9245 (282)
Total Primary energy kWh/year			4591.6433 (286)
Dwelling Primary energy Rate (DPER)			68.6300 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	66.9000 (1b)	x 2.4000 (2b)	= 160.5600 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	160.5600 (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) = 0.1246 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3746 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3184 (21)

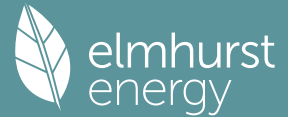
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4059	0.3980	0.3900	0.3502	0.3423	0.3025	0.3025	0.2945	0.3184	0.3423	0.3582	0.3741 (22b)
Effective ac	0.5824	0.5792	0.5761	0.5613	0.5586	0.5457	0.5457	0.5434	0.5507	0.5586	0.5641	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Semi-glazed door			2.1300	1.0000	2.1300		(26a)
TER Opening Type			14.6000	1.1450	16.7176		(27)
External Wall 1	49.4600	14.6000	34.8600	0.1800	6.2748		(29a)
Corridor Wall	14.8200	2.1300	12.6900	0.1800	2.2842		(29a)
Total net area of external elements Aum(A, m2)			64.2800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.4066		(33)
Main dwelling							
Party Wall 1			21.1100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							274.2572 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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	80.5134	80.7296	80.9426	81.9585	82.1514	83.0615	83.0615	83.2322	82.7085	82.1514	81.7621	81.3590
alpha	6.3676	6.3820	6.3962	6.4639	6.4768	6.5374	6.5374	6.5488	6.5139	6.4768	6.4508	6.4239
util living area	0.9940	0.9841	0.9557	0.8528	0.6662	0.4664	0.3377	0.3844	0.6296	0.9099	0.9846	0.9954 (86)
MIT	20.1781	20.3607	20.5970	20.8587	20.9740	20.9977	20.9998	20.9995	20.9863	20.8131	20.4543	20.1488 (87)
Th 2	20.1284	20.1305	20.1326	20.1425	20.1443	20.1529	20.1529	20.1545	20.1496	20.1443	20.1406	20.1367 (88)
util rest of house	0.9920	0.9790	0.9423	0.8174	0.6117	0.4055	0.2728	0.3140	0.5578	0.8777	0.9788	0.9939 (89)
MIT 2	19.1808	19.4126	19.7055	20.0126	20.1255	20.1518	20.1529	20.1544	20.1418	19.9731	19.5406	19.1500 (90)
Living area fraction	19.6530	19.8614	20.1276	20.4132	20.5272	20.5523	20.5538	20.5544	20.5415	20.3708	19.9731	19.6228 (92)
MIT	19.6530	19.8614	20.1276	20.4132	20.5272	20.5523	20.5538	20.5544	20.5415	20.3708	19.9731	19.6228 (93)
Temperature adjustment												0.0000
adjusted MIT	19.6530	19.8614	20.1276	20.4132	20.5272	20.5523	20.5538	20.5544	20.5415	20.3708	19.9731	19.6228 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9906	0.9771	0.9422	0.8292	0.6365	0.4343	0.3035	0.3474	0.5915	0.8871	0.9774	0.9927 (94)
Useful gains	522.1279	597.5479	642.5689	642.8187	535.2519	364.3279	242.5323	254.2271	391.0975	511.2554	509.5431	499.7153 (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	971.8643	944.5437	858.0696	715.9491	547.6318	365.2279	242.6020	254.3911	396.9369	606.1712	802.4419	966.1394 (97)
Space heating kWh	334.6038	233.1812	160.3325	52.6539	9.2106	0.0000	0.0000	0.0000	0.0000	70.6174	210.8871	347.0195 (98a)
Space heating requirement - total per year (kWh/year)												1418.5060
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	334.6038	233.1812	160.3325	52.6539	9.2106	0.0000	0.0000	0.0000	0.0000	70.6174	210.8871	347.0195 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1418.5060
Space heating per m2												21.2034 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	334.6038	233.1812	160.3325	52.6539	9.2106	0.0000	0.0000	0.0000	0.0000	70.6174	210.8871	347.0195 (98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)	
Space heating fuel (main heating system)	362.1253	252.3606	173.5200	56.9847	9.9682	0.0000	0.0000	0.0000	0.0000	76.4257	228.2328	375.5623 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Water heating													
Water heating requirement	219.8949	194.5369	206.9474	181.4786	174.6350	155.9585	153.5417	160.9897	164.0432	184.3443	195.8413	217.6056 (64)	
Efficiency of water heater (217)m	85.2781	84.7707	83.8406	82.0858	80.6911	80.3000	80.3000	80.3000	80.3000	82.5108	84.5404	85.3761 (217)	
Fuel for water heating, kWh/month	257.8563	229.4859	246.8343	221.0840	216.4241	194.2198	191.2101	200.4853	204.2879	223.4185	231.6540	254.8789 (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	19.9202	15.9807	14.3889	10.5419	8.1429	6.6528	7.4282	9.6555	12.5415	16.4551	18.5860	20.4739 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-22.7958	-33.1961	-49.2758	-57.2837	-63.4091	-59.7934	-59.0686	-54.9566	-47.9726	-38.7997	-25.4373	-19.5872 (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)	-9.8558	-21.0162	-42.2967	-64.2966	-85.7633	-86.4351	-85.4106	-71.9701	-52.3012	-30.3008	-13.2389	-7.7722 (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													1535.1797 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													2671.8392 (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)													160.7675 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1102.2334 (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)

Full SAP Calculation Printout



Energy used	0.0000 (237)
Total delivered energy for all uses	3351.5530 (238)

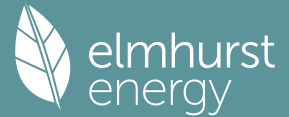
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1535.1797	0.2100	322.3877 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2671.8392	0.2100	561.0862 (264)
Space and water heating			883.4740 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	160.7675	0.1443	23.2037 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-531.5759	0.1339	-71.1780
PV Unit electricity exported	-570.6575	0.1255	-71.6438
Total			-142.8218 (269)
Total CO2, kg/year			775.7851 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.6000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1535.1797	1.1300	1734.7530 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2671.8392	1.1300	3019.1783 (278)
Space and water heating			4753.9313 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	160.7675	1.5338	246.5906 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-531.5759	1.4948	-794.6170
PV Unit electricity exported	-570.6575	0.4608	-262.9729
Total			-1057.5898 (283)
Total Primary energy kWh/year			4073.0329 (286)
Target Primary Energy Rate (TPER)			60.8800 (287)

Full SAP Calculation Printout



Property Reference	Be Lean Boiler				Issued on Date	24/10/2025
Assessment Reference	Flat 7		Prop Type Ref	Baseline		
Property						
SAP Rating	87 B	DER	11.48	TER	10.17	
Environmental	88 B	% DER < TER				-12.88
CO ₂ Emissions (t/year)	1.69	DFEE	29.65	TFEE	42.60	
Compliance Check	See BREL	% DFEE < TFEE				30.39
% DPER < TPER	-19.55	DPER	63.67	TPER	53.26	
Assessor Details	Mr. Neil Bradford				Assessor ID	T704-0001
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)
Main dwelling			
Ground floor	166.0000 (1b)	2.5000 (2b)	415.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	166.0000		415.0000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	415.0000 (5)

2. Ventilation rate

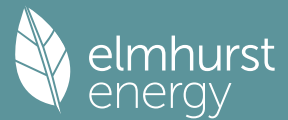
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.0482 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2982 (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) = 0.2982 (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	0.3802	0.3727	0.3653	0.3280	0.3206	0.2833	0.2833	0.2758	0.2982	0.3206	0.3355	0.3504 (22b)
Effective ac	0.5723	0.5695	0.5667	0.5538	0.5514	0.5401	0.5401	0.5380	0.5445	0.5514	0.5563	0.5614 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			22.0500	0.9615	21.2019		(27)
Solid door			2.1300	1.0000	2.1300		(26)
Roof Light			7.4400	0.9615	10.5283		(27a)
Mansard Roof wall	158.4600	22.0500	136.4100	0.1200	16.3692	9.0000	1227.6901 (29a)
Corridor walls	58.5900	2.1300	56.4600	0.1200	6.7752	190.0000	10727.4000 (29a)
Flat roof	166.0000	7.4400	158.5600	0.0861	13.6559	9.0000	1427.0400 (30)
Total net area of external elements Aum(A, m ²)			383.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.6605		(33)
Main dwelling							
Party Floor 1			166.0000			0.0000	0.0000 (32d)
Party Ceiling 1			74.0000			30.0000	2220.0000 (32b)
Internal Wall 1			211.6500			9.0000	1904.8499 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17506.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							105.4637 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				11.5200	0.0410	0.4723	
E3 Sill				10.5000	0.0060	0.0630	
E4 Jamb				25.2000	0.0100	0.2520	

Full SAP Calculation Printout



E7 Party floor between dwellings (in blocks of flats)	86.8200	0.0000	0.0000	
E14 Flat roof	86.8200	0.0490	4.2542	
E16 Corner (normal)	10.0000	0.0340	0.3400	
R11 Upstands or kerbs of rooflights	39.7800	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.3815 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		76.0420 (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	78.3730	77.9886	77.6119	75.8424	75.5113	73.9701	73.9701	73.6847	74.5637	75.5113	76.1810	76.8812 (38)
Average = Sum(39)m / 12 =	154.4150	154.0306	153.6539	151.8844	151.5533	150.0121	150.0121	149.7267	150.6057	151.5533	152.2231	152.9233 (39)
												151.8828
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9302	0.9279	0.9256	0.9150	0.9130	0.9037	0.9037	0.9020	0.9073	0.9130	0.9170	0.9212 (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													2.9572 (42)
Hot water usage for mixer showers													
130.3952	128.4356	125.5801	120.1166	116.0847	111.5883	109.0326	111.8665	114.9730	119.8007	125.3815	129.8956	(42a)	
Hot water usage for baths													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)	
Hot water usage for other uses													
44.9145	43.2812	41.6480	40.0147	38.3815	36.7482	36.7482	38.3815	40.0147	41.6480	43.2812	44.9145	(42c)	
Average daily hot water use (litres/day)												161.0514 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	175.3097	171.7168	167.2281	160.1313	154.4662	148.3366	145.7808	150.2480	154.9877	161.4487	168.6628	174.8101 (44)	
Energy conte	277.6477	244.5225	257.0233	219.2118	207.9412	182.3971	176.3093	186.0384	191.1153	219.0843	240.2910	273.7103 (45)	
Energy content (annual)										Total =	Sum(45)m =	2675.2923	
Distribution loss (46)m = 0.15 x (45)m													
41.6472	36.6784	38.5535	32.8818	31.1912	27.3596	26.4464	27.9058	28.6673	32.8626	36.0437	41.0566	(46)	
Water storage loss:													
Total storage loss:													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)	
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)	
Total heat required for water heating calculated for each month													
328.6066	290.5499	307.9822	268.5269	258.9001	231.7122	227.2682	236.9973	240.4304	270.0432	289.6061	324.6692 (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	328.6066	290.5499	307.9822	268.5269	258.9001	231.7122	227.2682	236.9973	240.4304	270.0432	289.6061	324.6692 (64)	
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 3275.2923 (64)	
Electric shower(s)												3275 (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													
105.0576	92.8106	98.2000	85.2167	81.8802	72.9758	71.3626	74.5975	75.8746	85.5853	92.2255	103.7484	(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
147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
172.8608	191.3816	172.8608	178.6228	172.8608	178.6228	172.8608	172.8608	172.8608	178.6228	172.8608	178.6228	172.8608 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
337.4476	340.9492	332.1252	313.3398	289.6267	267.3397	252.4506	248.9490	257.7730	276.5584	300.2715	322.5585	322.5585 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859 (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)												
-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873 (71)
Water heating gains (Table 5)												
141.2064	138.1110	131.9892	118.3565	110.0540	101.3553	95.9174	100.2654	105.3814	115.0340	128.0910	139.4468	139.4468 (72)
Total internal gains	721.8725	740.7995	707.3329	680.6769	642.8992	614.6756	588.5866	589.4329	609.1350	634.8109	677.3431	705.2238 (73)

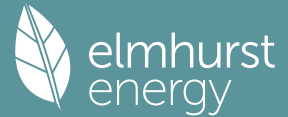
6. Solar gains

[Jan]												Gains	
				Area	Solar flux		g		FF		Access		Gains
				m2	Table 6a			Specific data			factor		W
					W/m2			or Table 6b			Table 6d		
Northeast				8.8200		11.2829		0.6300		0.0000	0.7700		48.2750 (75)
Southwest				13.2300		36.7938		0.6300		0.0000	0.7700		236.1381 (79)
North				7.4400		26.0000		0.6300		0.0000	1.0000		121.8672 (82)
Solar gains	406.2803	753.6046	1177.3632	1675.7444	2054.5694	2112.3799	2006.7202	1716.5955	1350.6692	873.9935	498.2591	339.9400	(83)
Total gains	1128.1529	1494.4041	1884.6961	2356.4213	2697.4686	2727.0554	2595.3068	2306.0285	1959.8042	1508.8044	1175.6022	1045.1638	(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)	

Full SAP Calculation Printout



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	31.4934	31.5720	31.6494	32.0181	32.0881	32.4177	32.4177	32.4795	32.2899	32.0881	31.9469	31.8006
alpha	3.0996	3.1048	3.1100	3.1345	3.1392	3.1612	3.1612	3.1653	3.1527	3.1392	3.1298	3.1200
util living area	0.9551	0.9057	0.8159	0.6573	0.4876	0.3435	0.2518	0.2941	0.4939	0.7747	0.9225	0.9632 (86)
MIT	19.4552	19.8154	20.2353	20.6221	20.8109	20.8902	20.8964	20.8926	20.8334	20.5074	19.9038	19.3920 (87)
Th 2	20.1419	20.1439	20.1458	20.1548	20.1565	20.1644	20.1644	20.1658	20.1613	20.1565	20.1531	20.1495 (88)
util rest of house	0.9489	0.8940	0.7954	0.6263	0.4498	0.3010	0.2049	0.2424	0.4424	0.7427	0.9108	0.9581 (89)
MIT 2	18.7179	19.0695	19.4705	19.8306	19.9925	20.0537	20.0643	20.0639	20.0194	19.7409	19.1683	18.6620 (90)
Living area fraction	18.9433	19.2975	19.7043	20.0726	20.2427	20.3064	20.3187	20.3172	20.2682	19.9753	19.3931	18.8852 (92)
MIT	18.9433	19.2975	19.7043	20.0726	20.2427	20.3064	20.3187	20.3172	20.2682	19.9753	19.3931	18.8852 (93)
Temperature adjustment												0.0000
adjusted MIT	18.9433	19.2975	19.7043	20.0726	20.2427	20.3064	20.3187	20.3172	20.2682	19.9753	19.3931	18.8852 (93)

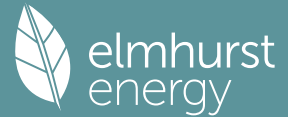
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9384	0.8806	0.7838	0.6232	0.4538	0.3083	0.2136	0.2518	0.4492	0.7352	0.8983	0.9486 (94)
Useful gains	1058.6204	1316.0184	1477.2632	1468.4476	1224.0826	840.8286	554.4515	580.7572	880.3459	1109.2234	1056.0501	991.4817 (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	2261.1488	2217.6632	2028.8903	1696.9387	1294.6747	856.0218	557.8518	586.5146	928.9722	1420.8530	1871.2975	2245.7018 (97)
Space heating kWh	894.6811	605.9053	410.4105	164.5136	52.5205	0.0000	0.0000	0.0000	0.0000	231.8524	586.9781	933.1398 (98a)
Space heating requirement - total per year (kWh/year)												3880.0014
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	894.6811	605.9053	410.4105	164.5136	52.5205	0.0000	0.0000	0.0000	0.0000	231.8524	586.9781	933.1398 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3880.0014
Space heating per m2										(98c) / (4) =		23.3735 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												84.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	894.6811	605.9053	410.4105	164.5136	52.5205	0.0000	0.0000	0.0000	0.0000	231.8524	586.9781	933.1398 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	1065.0966	721.3159	488.5840	195.8495	62.5244	0.0000	0.0000	0.0000	0.0000	276.0148	698.7835	1110.8807 (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	328.6066	290.5499	307.9822	268.5269	258.9001	231.7122	227.2682	236.9973	240.4304	270.0432	289.6061	324.6692 (64)
Efficiency of water heater (217)m	81.3768	80.8553	79.8900	78.1823	76.3801	75.0000	75.0000	75.0000	75.0000	78.9054	80.7968	75.0000 (216)
Fuel for water heating, kWh/month	403.8086	359.3456	385.5077	343.4624	338.9625	308.9496	303.0243	315.9964	320.5739	342.2366	358.4378	398.4831 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	45.7163	36.6753	33.0220	24.1934	18.6876	15.2680	17.0475	22.1590	28.7823	37.7640	42.6543	46.9869 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												4619.0493 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												4178.7883 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												368.9566 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)

Full SAP Calculation Printout



Total delivered energy for all uses

9207.7942 (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	4619.0493	0.2100	970.0004	(261)
Total CO ₂ associated with community systems			0.0000	(373)
Water heating (other fuel)			877.5455	(264)
Space and water heating	4178.7883	0.2100	1847.5459	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	368.9566	0.1443	53.2518	(268)
Total CO ₂ , kg/year			1906.4849	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.4800	(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	4619.0493	1.1300	5219.5258	(275)
Total CO ₂ associated with community systems			0.0000	(473)
Water heating (other fuel)			4722.0308	(278)
Space and water heating	4178.7883	1.1300	9941.5565	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	368.9566	1.5338	565.9179	(282)
Total Primary energy kWh/year			10569.4992	(286)
Dwelling Primary energy Rate (DPER)			63.6700	(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)	
Main dwelling	166.0000	2.5000	415.0000	(1b) - (3b)
Ground floor				(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	166.0000		415.0000	(5)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)

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	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0964 (8)
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	5.0000		(17)
Infiltration rate	0.3464		(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) =	0.3464	(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	0.4416	0.4330	0.4243	0.3810	0.3724	0.3291	0.3291	0.3204	0.3464	0.3724	0.3897	0.4070	(22b)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.1300	1.0000	2.1300			(26)
TER Opening Type			22.0500	1.1450	25.2481			(27)
TER Roof Light			7.4400	1.5918	15.0441			(27a)
Mansard Roof wall	158.4600	22.0500	136.4100	0.1800	24.5538			(29a)
Corridor walls	58.5900	2.1300	56.4600	0.1800	10.1628			(29a)
Flat roof	166.0000	7.4400	158.5600	0.1100	17.4416			(30)
Total net area of external elements Aum(A, m ²)			383.0500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	94.5804		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							109.9216	(35)

Full SAP Calculation Printout



List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	11.5200	0.0500	0.5760
E3 Sill	10.5000	0.0500	0.5250
E4 Jamb	25.2000	0.0500	1.2600
E7 Party floor between dwellings (in blocks of flats)	86.8200	0.0700	6.0774
E14 Flat roof	86.8200	0.0800	6.9456
E16 Corner (normal)	10.0000	0.0900	0.9000
R11 Upstands or kerbs of rooflights	39.7800	0.0800	3.1824
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			19.4664 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 114.0468 (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	81.8309	81.3122	80.8039	78.4162	77.9694	75.8898	75.8898	75.5047	76.6908	77.9694	78.8732	79.8180	(38)
Heat transfer coeff	195.8777	195.3590	194.8507	192.4630	192.0162	189.9366	189.9366	189.5515	190.7376	192.0162	192.9200	193.8648	(39)
Average = Sum(39)m / 12 =												192.4608	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1800	1.1769	1.1738	1.1594	1.1567	1.1442	1.1442	1.1419	1.1490	1.1567	1.1622	1.1679	(40)
HLP (average)												1.1594	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9572 (42)
Hot water usage for mixer showers													
94.8329	93.4077	91.3310	87.3575	84.4252	81.1552	79.2964	81.3575	83.6167	87.1278	91.1866	94.4695	(42a)	
Hot water usage for baths													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)	
Hot water usage for other uses													
44.9145	43.2812	41.6480	40.0147	38.3815	36.7482	36.7482	38.3815	40.0147	41.6480	43.2812	44.9145	(42c)	
Average daily hot water use (litres/day)												128.2641	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	139.7474	136.6890	132.9790	127.3723	122.8067	117.9034	116.0447	119.7389	123.6314	128.7758	134.4678	139.3840	(44)
Energy conte	221.3257	194.6432	204.3837	174.3663	165.3214	144.9760	140.3460	148.2618	152.4499	174.7475	191.5740	218.2417	(45)
Energy content (annual)										Total =	Sum(45)m =	2130.6372	
Distribution loss (46)m = 0.15 x (45)m													
33.1988	29.1965	30.6576	26.1549	24.7982	21.7464	21.0519	22.2393	22.8675	26.2121	28.7361	32.7363	(46)	
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)	
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
272.2846	240.6706	255.3426	223.6813	216.2803	194.2910	191.3049	199.2207	201.7650	225.7064	240.8891	269.2006	(62)	
WWHRS	-43.3536	-38.3423	-40.1498	-33.2457	-30.9838	-26.5130	-24.8517	-26.4273	-27.4314	-32.3386	-36.6357	-42.5508	(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													
228.9309	202.3283	215.1928	190.4357	185.2966	167.7780	166.4531	172.7934	174.3336	193.3678	204.2534	226.6498	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) =	Sum(64)m =	2327.8135	(64)
Electric shower(s)												2328	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
86.3305	76.2257	80.6973	70.3056	67.7091	60.5333	59.4048	62.0368	63.0184	70.8433	76.0271	85.3051	(65)	

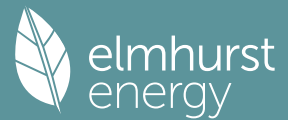
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	172.8608	191.3816	172.8608	178.6228	172.8608	178.6228	172.8608	172.8608	178.6228	172.8608	178.6228	172.8608 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	337.4476	340.9492	332.1252	313.3398	289.6267	267.3397	252.4506	248.9490	257.7730	276.5584	300.2715	322.5585 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859 (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)	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873 (71)
Water heating gains (Table 5)	116.0356	113.4311	108.4641	97.6466	91.0069	84.0740	79.8451	83.3828	87.5255	95.2194	105.5932	114.6574 (72)
Total internal gains	696.7017	716.1197	683.8078	659.9670	623.8521	597.3943	572.5143	572.5503	591.2791	614.9963	654.8453	680.4344 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
Northeast					8.8200	11.2829	0.6300	0.7000			0.7700			30.4132 (75)
Southwest					13.2300	36.7938	0.6300	0.7000			0.7700			148.7670 (79)
North					7.4400	26.0000	0.6300	0.7000			1.0000			76.7763 (82)
Solar gains	255.9566	474.7709	741.7388	1055.7190	1294.3787	1330.7993	1264.2337	1081.4552	850.9216	550.6159	313.9032	214.1622	(83)	
Total gains	952.6583	1190.8906	1425.5467	1715.6859	1918.2308	1928.1936	1836.7480	1654.0054	1442.2007	1165.6123	968.7485	894.5966	(84)	

Full SAP Calculation Printout



7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.8764	25.9451	26.0128	26.3355	26.3968	26.6858	26.6858	26.7400	26.5737	26.3968	26.2731	26.1451	21.0000 (85)
alpha	2.7251	2.7297	2.7342	2.7557	2.7598	2.7791	2.7791	2.7827	2.7716	2.7598	2.7515	2.7430	
util living area	0.9752	0.9549	0.9172	0.8338	0.7072	0.5521	0.4257	0.4811	0.7004	0.8914	0.9603	0.9789	(86)
MIT	18.3112	18.6924	19.2541	19.9619	20.5037	20.8245	20.9375	20.9115	20.6452	19.8920	18.9779	18.2556	(87)
Th 2	19.9360	19.9386	19.9410	19.9526	19.9548	19.9649	19.9649	19.9668	19.9610	19.9548	19.9504	19.9458	(88)
util rest of house	0.9710	0.9476	0.9037	0.8069	0.6607	0.4819	0.3357	0.3880	0.6358	0.8675	0.9527	0.9754	(89)
MIT 2	16.7870	17.2705	17.9767	18.8510	19.4833	19.8312	19.9312	19.9156	19.6619	18.7895	17.6447	16.7218	(90)
Living area fraction									fLA = Living area / (4) =			0.3057	(91)
MIT	17.2530	17.7052	18.3673	19.1907	19.7953	20.1349	20.2389	20.2200	19.9625	19.1265	18.0523	17.1907	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.2530	17.7052	18.3673	19.1907	19.7953	20.1349	20.2389	20.2200	19.9625	19.1265	18.0523	17.1907	(93)

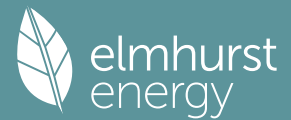
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9556	0.9263	0.8777	0.7840	0.6529	0.4941	0.3604	0.4119	0.6359	0.8436	0.9331	0.9615	(94)
Useful gains	910.3299	1103.1071	1251.2399	1345.0400	1252.4794	952.7219	661.9239	681.3426	917.0658	983.3364	903.9008	860.1485	(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	2537.2041	2501.6077	2312.3439	1980.5697	1554.4204	1051.2794	691.1565	724.0954	1118.2028	1637.2326	2112.9121	2518.4374	(97)
Space heating kWh	1210.3944	939.7924	789.4613	457.5814	224.6441	0.0000	0.0000	0.0000	0.0000	486.4988	870.4882	1233.7670	(98a)
Space heating requirement - total per year (kWh/year)												6212.6275	
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	1210.3944	939.7924	789.4613	457.5814	224.6441	0.0000	0.0000	0.0000	0.0000	486.4988	870.4882	1233.7670	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6212.6275	
Space heating per m2										(98c) / (4) =		37.4255	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	1210.3944	939.7924	789.4613	457.5814	224.6441	0.0000	0.0000	0.0000	0.0000	486.4988	870.4882	1233.7670	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	1309.9506	1017.0914	854.3954	495.2179	243.1213	0.0000	0.0000	0.0000	0.0000	526.5138	942.0868	1335.2456	(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	228.9309	202.3283	215.1928	190.4357	185.2966	167.7780	166.4531	172.7934	174.3336	193.3678	204.2534	226.6498	(64)
Efficiency of water heater (217)m	87.4110	87.2447	86.9064	86.1874	84.7951	80.3000	80.3000	80.3000	80.3000	86.2721	87.1266	80.3000	(216)
Fuel for water heating, kWh/month	261.9017	231.9089	247.6145	220.9554	218.5227	208.9390	207.2891	215.1848	217.1029	224.1372	234.4328	259.1867	(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	35.9171	28.8140	25.9438	19.0075	14.6820	11.9953	13.3934	17.4092	22.6129	29.6693	33.5114	36.9153	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-52.4765	-74.3513	-107.3638	-121.2213	-131.0373	-122.2976	-120.6591	-113.6806	-101.5294	-85.1172	-57.7732	-45.3153	(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	-28.5424	-60.1665	-119.8565	-180.4577	-239.1064	-240.5415	-237.8393	-201.2646	-147.2816	-86.3429	-38.1945	-22.5721	(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												6723.6229	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2747.1758	(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)												289.8712	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2734.9886	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)

Full SAP Calculation Printout



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	7111.6812 (238)

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

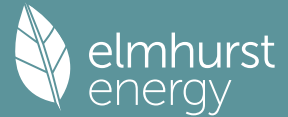
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	6723.6229	0.2100	1411.9608 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2747.1758	0.2100	576.9069 (264)
Space and water heating			1988.8677 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	289.8712	0.1443	41.8374 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1132.8227	0.1345	-152.3819
PV Unit electricity exported	-1602.1659	0.1258	-201.5697
Total			-353.9516 (269)
Total CO2, kg/year			1688.6828 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1700 (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	6723.6229	1.1300	7597.6938 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2747.1758	1.1300	3104.3086 (278)
Space and water heating			10702.0024 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	289.8712	1.5338	444.6142 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1132.8227	1.4971	-1695.9963
PV Unit electricity exported	-1602.1659	0.4618	-739.8911
Total			-2435.8873 (283)
Total Primary energy kWh/year			8840.8301 (286)
Target Primary Energy Rate (TPER)			53.2600 (287)

ii. Be Green/ TER Baseline

Full SAP Calculation Printout



Property Reference	Be Green ASHP				Issued on Date	24/10/2025
Assessment Reference	Flat 1		Prop Type Ref	Baseline		
Property						
SAP Rating	83 B	DER	4.19	TER	12.53	
Environmental	97 A	% DER < TER				66.56
CO ₂ Emissions (t/year)	0.28	DFEE	25.43	TFEE	37.32	
Compliance Check	See BREL	% DFEE < TFEE				31.87
% DPER < TPER	33.20	DPER	44.00	TPER	65.87	
Assessor Details	Mr. Neil Bradford				Assessor ID	T704-0001
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)
Main dwelling			
Ground floor	75.3400 (1b)	2.4000 (2b)	180.8160 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.3400		180.8160 (4)
Dwelling volume			180.8160 (5)

2. Ventilation rate

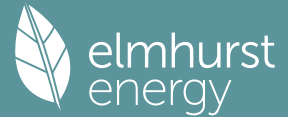
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1106 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3106 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2873 (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	0.3663	0.3591	0.3520	0.3160	0.3089	0.2729	0.2729	0.2658	0.2873	0.3089	0.3232	0.3376 (22b)
Effective ac	0.5671	0.5645	0.5619	0.5499	0.5477	0.5373	0.5373	0.5353	0.5413	0.5477	0.5522	0.5570 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			15.9200	0.9615	15.3077		(27)
Solid door			2.1300	1.0000	2.1300		(26)
Heatloss Floor 1			74.0000	0.0900	6.6600	110.0000	8140.0000 (28a)
External Wall 1	50.8300	15.9200	34.9100	0.1300	4.5383	190.0000	6632.9003 (29a)
Corridor Walls	45.9700	2.1300	43.8400	0.1200	5.2608	190.0000	8329.6002 (29a)
Total net area of external elements Aum(A, m ²)			170.8000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.8968		(33)
Main dwelling							
Party Ceiling 1			74.0000			30.0000	2220.0000 (32b)
Internal Wall 1			125.9700			9.0000	1133.7300 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26456.2306 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							351.1578 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				8.5900	0.0410	0.3522	
E3 Sill				7.5800	0.0060	0.0455	
E4 Jamb				25.2000	0.0100	0.2520	
E5 Ground floor (normal)				42.8500	0.0600	2.5710	
E16 Corner (normal)				9.6000	0.0340	0.3264	

Full SAP Calculation Printout



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

Point Thermal bridges
Total fabric heat loss

(33) + (36) + (36a) =
3.5471 (36)
0.0000
37.4439 (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	33.8383	33.6828	33.5304	32.8147	32.6807	32.0573	32.0573	31.9419	32.2975	32.6807	32.9517	33.2349	(38)
Heat transfer coeff	71.2821	71.1267	70.9743	70.2585	70.1246	69.5012	69.5012	69.3858	69.7413	70.1246	70.3955	70.6787	(39)
Average = Sum(39)m / 12 =												70.2579	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9461	0.9441	0.9421	0.9326	0.9308	0.9225	0.9225	0.9210	0.9257	0.9308	0.9344	0.9381	(40)
HLP (average)												0.9325	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3685 (42)

Hot water usage for mixer showers 87.9061 86.5850 84.6600 80.9768 78.2587 75.2274 73.5045 75.4150 77.5092 80.7638 84.5261 87.5693 (42a)

Hot water usage for baths 27.6160 27.2058 26.6283 25.5633 24.7660 23.8818 23.4042 23.9777 24.6022 25.5483 26.6351 27.5226 (42b)

Hot water usage for other uses 38.8859 37.4718 36.0578 34.6438 33.2297 31.8157 31.8157 33.2297 34.6438 36.0578 37.4718 38.8859 (42c)

Average daily hot water use (litres/day) 142.0016 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	154.4079	151.2627	147.3461	141.1839	136.2544	130.9249	128.7244	132.6224	136.7551	142.3699	148.6331	153.9777	(44)
Energy conte	244.5444	215.3960	226.4654	193.2737	183.4245	160.9875	155.6810	164.2142	168.6327	193.1946	211.7551	241.0919	(45)
Energy content (annual)										Total = Sum(45)m =		2358.6610	
Distribution loss (46)m = 0.15 x (45)m	36.6817	32.3094	33.9698	28.9911	27.5137	24.1481	23.3521	24.6321	25.2949	28.9792	31.7633	36.1638	(46)
Water storage loss:													
Store volume												80.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4300	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.8580	(55)
Total storage loss	26.5980	24.0240	26.5980	25.7400	26.5980	25.7400	26.5980	26.5980	25.7400	26.5980	25.7400	26.5980	(56)
If cylinder contains dedicated solar storage	26.5980	24.0240	26.5980	25.7400	26.5980	25.7400	26.5980	26.5980	25.7400	26.5980	25.7400	26.5980	(57)
Primary loss	31.1612	28.1456	31.1612	30.1560	31.1612	22.5120	23.2624	23.2624	22.5120	31.1612	30.1560	31.1612	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	302.3036	267.5656	284.2246	249.1697	241.1837	209.2395	205.5414	214.0746	216.8847	250.9538	267.6511	298.8511	(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	302.3036	267.5656	284.2246	249.1697	241.1837	209.2395	205.5414	214.0746	216.8847	250.9538	267.6511	298.8511	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				3007.6434	(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	127.5184	113.3549	121.5071	108.9803	107.1960	92.1299	91.6522	94.4896	94.6720	110.4446	115.1254	126.3704	(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	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.4433	118.9551	107.4433	111.0248	107.4433	111.0248	107.4433	107.4433	111.0248	107.4433	111.0248	107.4433	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	209.4269	211.6001	206.1237	194.4651	179.7483	165.9165	156.6761	154.5029	159.9792	171.6378	186.3547	200.1864	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	(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)	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	(71)
Water heating gains (Table 5)	171.3957	168.6828	163.3160	151.3615	144.0807	127.9582	123.1885	127.0021	131.4889	148.4470	159.8963	169.8527	(72)
Total internal gains	546.7935	557.7656	535.4106	515.3790	489.7999	463.4271	445.8355	447.4759	461.0205	486.0557	515.8033	536.0101	(73)

6. Solar gains

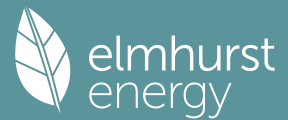
[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	2.5200	11.2829	0.5700	0.7000	0.7700	7.8619	(75)						
Southeast	4.5800	36.7938	0.5700	0.7000	0.7700	46.5958	(77)						
Southwest	8.8200	36.7938	0.5700	0.7000	0.7700	89.7325	(79)						
Solar gains	144.1902	248.2207	346.5627	441.0345	504.6075	505.6263	485.5351	437.3932	379.1675	276.2070	173.1822	123.0890	(83)
Total gains	690.9837	805.9863	881.9734	956.4135	994.4073	969.0534	931.3706	884.8691	840.1880	762.2627	688.9855	659.0991	(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)

Full SAP Calculation Printout



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	103.0967	103.3220	103.5439	104.5987	104.7985	105.7385	105.7385	105.9144	105.3744	104.7985	104.3952	103.9768
alpha	7.8731	7.8881	7.9029	7.9732	7.9866	8.0492	8.0492	8.0610	8.0250	7.9866	7.9597	7.9318
util living area	0.9942	0.9806	0.9434	0.8297	0.6479	0.4585	0.3283	0.3606	0.5699	0.8681	0.9811	0.9958 (86)
Living	20.5416	20.6653	20.7966	20.9138	20.9544	20.9609	20.9613	20.9613	20.9592	20.9047	20.7088	20.5184
Non living	19.7204	19.8420	19.9657	20.0705	20.0992	20.1096	20.1097	20.1111	20.1062	20.0676	19.8928	19.7036
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	20.7655	20.6653	20.7966	20.9138	20.9544	20.9609	20.9613	20.9613	20.9592	20.9047	20.7088	20.5858 (87)
Th 2	20.1285	20.1302	20.1319	20.1399	20.1414	20.1484	20.1484	20.1497	20.1457	20.1414	20.1384	20.1352 (88)
util rest of house	0.9917	0.9732	0.9242	0.7876	0.5914	0.3978	0.2648	0.2940	0.5008	0.8229	0.9725	0.9940 (89)
MIT 2	19.9197	19.8420	19.9657	20.0705	20.0992	20.1096	20.1097	20.1111	20.1062	20.0676	19.8928	19.7640 (90)
Living area fraction									fLA = Living area /	(4) =		0.3589 (91)
MIT	20.2233	20.1375	20.2639	20.3732	20.4062	20.4152	20.4154	20.4162	20.4124	20.3680	20.1856	20.0589 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2233	20.1375	20.2639	20.3732	20.4062	20.4152	20.4154	20.4162	20.4124	20.3680	20.1856	20.0589 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9920	0.9733	0.9275	0.7996	0.6091	0.4169	0.2847	0.3149	0.5226	0.8358	0.9730	0.9938 (94)
Useful gains	685.4854	784.4598	818.0239	764.7735	605.6675	403.9545	265.1651	278.6530	439.0589	637.0803	670.3991	655.0397 (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	1135.0446	1083.7931	976.8832	806.0882	610.5171	404.1612	265.1728	278.6702	440.2339	684.9779	921.1694	1120.8894 (97)
Space heating kWh	334.4720	201.1520	118.1913	29.7466	3.6081	0.0000	0.0000	0.0000	0.0000	35.6359	180.5546	346.5922 (98a)
Space heating requirement - total per year (kWh/year)												1249.9528
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	334.4720	201.1520	118.1913	29.7466	3.6081	0.0000	0.0000	0.0000	0.0000	35.6359	180.5546	346.5922 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1249.9528
Space heating per m2										(98c) / (4) =		16.5908 (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 %)												231.5318 (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	334.4720	201.1520	118.1913	29.7466	3.6081	0.0000	0.0000	0.0000	0.0000	35.6359	180.5546	346.5922 (98)
Space heating efficiency (main heating system 1)	231.5318	231.5318	231.5318	231.5318	231.5318	0.0000	0.0000	0.0000	0.0000	231.5318	231.5318	231.5318 (210)
Space heating fuel (main heating system)	144.4605	86.8788	51.0476	12.8477	1.5584	0.0000	0.0000	0.0000	0.0000	15.3913	77.9826	149.6953 (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	302.3036	267.5656	284.2246	249.1697	241.1837	209.2395	205.5414	214.0746	216.8847	250.9538	267.6511	298.8511 (64)
Efficiency of water heater (217)m	181.6726	181.6726	181.6726	181.6726	181.6726	181.6726	181.6726	181.6726	181.6726	181.6726	181.6726	181.6726 (216)
Fuel for water heating, kWh/month	166.4002	147.2790	156.4488	137.1531	132.7573	115.1739	113.1383	117.8354	119.3822	138.1351	147.3260	164.4998 (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	21.8683	17.5436	15.7960	11.5729	8.9392	7.3034	8.1546	10.5997	13.7680	18.0643	20.4036	22.4761 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-5.5970	-9.9605	-18.3565	-25.6341	-31.9651	-31.4161	-30.7264	-26.4901	-19.8909	-12.8417	-6.7041	-4.5657 (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												539.8621 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												181.6726
Water heating fuel used												1655.5292 (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)												176.4897 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-224.1483 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)

Full SAP Calculation Printout



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	2147.7327 (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	539.8621	0.1585	85.5698 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1655.5292	0.1412	233.7489 (264)
Space and water heating			319.3187 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	176.4897	0.1443	25.4729 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-224.1483	0.1306	-29.2768
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-29.2768 (269)
Total CO2, kg/year			315.5148 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1900 (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	539.8621	1.5867	856.5972 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1655.5292	1.5221	2519.8783 (278)
Space and water heating			3376.4755 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	176.4897	1.5338	270.7058 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-224.1483	1.4825	-332.2985
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-332.2985 (283)
Total Primary energy kWh/year			3314.8829 (286)
Dwelling Primary energy Rate (DPER)			44.0000 (287)

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

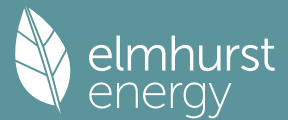
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	75.3400	2.4000	180.8160
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.3400		
Dwelling volume			180.8160

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) = 0.1659 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4159 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3847 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.4905 0.4809 0.4713 0.4232 0.4136 0.3655 0.3655 0.3559 0.3847 0.4136 0.4328 0.4520 (22b)
Effective ac	0.6203 0.6156 0.6111 0.5895 0.5855 0.5668 0.5668 0.5633 0.5740 0.5855 0.5937 0.6022 (25)

Full SAP Calculation Printout



3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1300	1.0000	2.1300		(26)
TER Opening Type			15.9200	1.1450	18.2290		(27)
Heatloss Floor 1			74.0000	0.1300	9.6200		(28a)
External Wall 1		15.9200	34.9100	0.1800	6.2838		(29a)
Corridor Walls	50.8300	2.1300	43.8400	0.1800	7.8912		(31)
Total net area of external elements Aum(A, m2)			170.8000				(29a)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.1540		(33)

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

360.9800 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	8.5900	0.0500	0.4295
E3 Sill	7.5800	0.0500	0.3790
E4 Jamb	25.2000	0.0500	1.2600
E5 Ground floor (normal)	42.8500	0.1600	6.8560
E16 Corner (normal)	9.6000	0.0900	0.8640

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

9.7885 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 53.9425 (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	37.0131	36.7344	36.4611	35.1778	34.9377	33.8199	33.8199	33.6129	34.2505	34.9377	35.4234	35.9312
Heat transfer coeff	90.9556	90.6769	90.4037	89.1203	88.8802	87.7624	87.7624	87.5554	88.1930	88.8802	89.3659	89.8738
Average = Sum(39)m / 12 =												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2073	1.2036	1.1999	1.1829	1.1797	1.1649	1.1649	1.1621	1.1706	1.1797	1.1862	1.1929
HLP (average)												1.1829
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

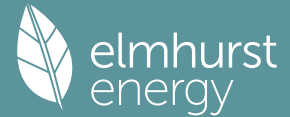
Assumed occupancy													2.3685 (42)
Hot water usage for mixer showers													
63.9317	62.9709	61.5709	58.8922	56.9154	54.7109	53.4578	54.8472	56.3703	58.7373	61.4736	63.6868	63.6868	(42a)
Hot water usage for baths													
27.6160	27.2058	26.6283	25.5633	24.7660	23.8818	23.4042	23.9777	24.6022	25.5483	26.6351	27.5226	27.5226	(42b)
Hot water usage for other uses													
38.8859	37.4718	36.0578	34.6438	33.2297	31.8157	31.8157	33.2297	34.6438	36.0578	37.4718	38.8859	38.8859	(42c)
Average daily hot water use (litres/day)													119.8980 (43)
Daily hot water use													
130.4335	127.6486	124.2570	119.0993	114.9111	110.4083	108.6777	112.0547	115.6162	120.3434	125.5805	130.0952	130.0952	(44)
Energy conte	206.5748	181.7699	190.9783	163.0410	154.6924	135.7599	131.4363	138.7471	142.5664	163.3048	178.9124	203.6977	(45)
Energy content (annual)										Total = Sum(45)m =		1991.4810	
Distribution loss (46)m = 0.15 x (45)m													
30.9862	27.2655	28.6467	24.4562	23.2039	20.3640	19.7154	20.8121	21.3850	24.4957	26.8369	30.5546	30.5546	(46)
Water storage loss:													
Store volume													80.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.9749 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.5264 (55)
Total storage loss													
16.3190	14.7398	16.3190	15.7926	16.3190	15.7926	16.3190	16.3190	15.7926	16.3190	15.7926	16.3190	16.3190	(56)
If cylinder contains dedicated solar storage													
16.3190	14.7398	16.3190	15.7926	16.3190	15.7926	16.3190	16.3190	15.7926	16.3190	15.7926	16.3190	16.3190	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
246.1562	217.5208	230.5597	201.3456	194.2738	174.0645	171.0177	178.3285	180.8710	202.8862	217.2170	243.2791	243.2791	(62)
WWHRS	-29.2269	-25.8485	-27.0671	-22.4126	-20.8877	-17.8738	-16.7538	-17.8160	-18.4929	-21.8011	-24.6980	-28.6857	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
216.9293	191.6723	203.4927	178.9330	173.3861	156.1907	154.2638	160.5125	162.3781	181.0851	192.5190	214.5934	214.5934	(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													
100.3513	89.0392	95.1654	84.8548	83.1004	75.7839	75.3677	77.7985	78.0470	85.9640	90.1321	99.3946	99.3946	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	118.4252	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
105.8770	117.2209	105.8770	109.4062	105.8770	109.4062	105.8770	105.8770	109.4062	105.8770	109.4062	105.8770	105.8770	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
209.4269	211.6001	206.1237	194.4651	179.7483	165.9165	156.6761	154.5029	159.9792	171.6378	186.3547	200.1864	200.1864	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	34.8425	(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)													
-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	-94.7402	(71)
Water heating gains (Table 5)													
134.8807	132.4989	127.9105	117.8539	111.6940	105.2554	101.3007	104.5679	108.3986	115.5430	125.1834	133.5949	133.5949	(72)
Total internal gains													
511.7121	522.8475	501.4388	483.2528	458.8468	439.1056	422.3812	423.4753	436.3116	454.5853	482.4718	501.1858	501.1858	(73)

6. Solar gains

Full SAP Calculation Printout



[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W		
Northeast	2.5200				11.2829	0.6300		0.7000		0.7700	8.6895 (75)	
Southeast	4.5800				36.7938	0.6300		0.7000		0.7700	51.5006 (77)	
Southwest	8.8200				36.7938	0.6300		0.7000		0.7700	99.1780 (79)	
Solar gains	159.3681	274.3492	383.0430	487.4592	557.7240	558.8501	536.6441	483.4346	419.0799	305.2814	191.4119	136.0458 (83)
Total gains	671.0803	797.1966	884.4818	970.7120	1016.5709	997.9557	959.0253	906.9099	855.3915	759.8667	673.8837	637.2316 (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	83.0571	83.3124	83.5642	84.7675	84.9965	86.0791	86.0791	86.2826	85.6588	84.9965	84.5345	84.0569
alpha	6.5371	6.5542	6.5709	6.6512	6.6664	6.7386	6.7386	6.7522	6.7106	6.6664	6.6356	6.6038
util living area	0.9973	0.9913	0.9742	0.9103	0.7650	0.5577	0.4021	0.4431	0.6889	0.9380	0.9920	0.9981 (86)
MIT	20.1120	20.2998	20.5300	20.7958	20.9487	20.9946	20.9995	20.9990	20.9798	20.7780	20.3987	20.0849 (87)
Th 2	19.9142	19.9171	19.9200	19.9337	19.9363	19.9482	19.9482	19.9504	19.9436	19.9363	19.9311	19.9257 (88)
util rest of house	0.9961	0.9874	0.9626	0.8748	0.6955	0.4688	0.3063	0.3426	0.5943	0.9045	0.9877	0.9971 (89)
MIT 2	18.9060	19.1462	19.4343	19.7533	19.9026	19.9461	19.9481	19.9502	19.9342	19.7445	19.2841	18.8804 (90)
Living area fraction	fLA = Living area / (4) =											0.3589 (91)
MIT	19.3388	19.5602	19.8276	20.1274	20.2781	20.3224	20.3254	20.3266	20.3095	20.1154	19.6841	19.3127 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3388	19.5602	19.8276	20.1274	20.2781	20.3224	20.3254	20.3266	20.3095	20.1154	19.6841	19.3127 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9951	0.9857	0.9614	0.8821	0.7190	0.5008	0.3408	0.3788	0.6283	0.9112	0.9863	0.9964 (94)
Useful gains	667.8134	785.7760	850.3428	856.2611	730.9492	499.7603	326.8012	343.4925	537.4203	692.3750	664.6698	634.9401 (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	1367.8644	1329.3425	1204.8632	1000.5920	762.4214	502.2125	326.9540	343.7981	547.6301	845.7318	1124.5910	1358.2340 (97)
Space heating kWh	520.8379	365.2767	263.7632	103.9183	23.4153	0.0000	0.0000	0.0000	0.0000	114.0974	331.1432	538.1306 (98a)
Space heating requirement - total per year (kWh/year)												2260.5827
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	520.8379	365.2767	263.7632	103.9183	23.4153	0.0000	0.0000	0.0000	0.0000	114.0974	331.1432	538.1306 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2260.5827
Space heating per m2	(98c) / (4) =											30.0051 (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	520.8379	365.2767	263.7632	103.9183	23.4153	0.0000	0.0000	0.0000	0.0000	114.0974	331.1432	538.1306 (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)	564.2881	395.7494	285.7673	112.5875	25.3687	0.0000	0.0000	0.0000	0.0000	123.6159	358.7684	583.0235 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	216.9293	191.6723	203.4927	178.9330	173.3861	156.1907	154.2638	160.5125	162.3781	181.0851	192.5190	214.5934 (64)
Efficiency of water heater (217)m	85.9497	85.4821	84.6426	82.8864	80.7740	79.8000	79.8000	79.8000	79.8000	83.0537	85.2647	79.8000 (216)
Fuel for water heating, kWh/month	252.3909	224.2250	240.4140	215.8775	214.6557	195.7277	193.3131	201.1435	203.4813	218.0339	225.7899	249.4293 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	21.9991	17.6485	15.8905	11.6421	8.9927	7.3471	8.2034	10.6631	13.8503	18.1724	20.5257	22.6106 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-25.5379	-37.1182	-54.9895	-63.7885	-70.4800	-66.4011	-65.5833	-61.0739	-53.4062	-43.3113	-28.4679	-21.9505 (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	-11.2329	-23.9334	-48.1357	-73.1301	-97.5118	-98.2754	-97.1232	-81.8656	-59.5180	-34.5068	-15.0876	-8.8606 (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												

Full SAP Calculation Printout



Space heating fuel - main system 1	2449.1687 (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	2634.4817 (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)	177.5457 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1241.2894 (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	4105.9067 (238)

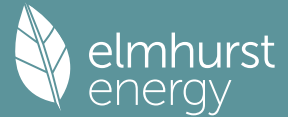
----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2449.1687	0.2100	514.3254 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2634.4817	0.2100	553.2412 (264)
Space and water heating			1067.5666 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	177.5457	0.1443	25.6253 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-592.1083	0.1339	-79.3107
PV Unit electricity exported	-649.1811	0.1256	-81.5110
Total			-160.8217 (269)
Total CO2, kg/year			944.2995 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.5300 (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	2449.1687	1.1300	2767.5606 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2634.4817	1.1300	2976.9643 (278)
Space and water heating			5744.5249 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	177.5457	1.5338	272.3255 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-592.1083	1.4950	-885.2059
PV Unit electricity exported	-649.1811	0.4609	-299.1909
Total			-1184.3968 (283)
Total Primary energy kWh/year			4962.5544 (286)
Target Primary Energy Rate (TPER)			65.8700 (287)

Full SAP Calculation Printout



Property Reference	Be Green ASHP				Issued on Date	24/10/2025
Assessment Reference	Flat 2		Prop Type Ref	Baseline		
Property						
SAP Rating	84 B	DER	3.89	TER	10.87	
Environmental	97 A	% DER < TER				64.21
CO ₂ Emissions (t/year)	0.27	DFEE	23.22	TFEE	30.27	
Compliance Check	See BREL	% DFEE < TFEE				23.27
% DPER < TPER	28.16	DPER	40.88	TPER	56.90	
Assessor Details	Mr. Neil Bradford				Assessor ID	T704-0001
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)
Main dwelling			
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.5000	2.4000	183.6000
Dwelling volume			183.6000

2. Ventilation rate

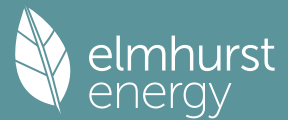
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1089 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3589 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3051 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3890	0.3814	0.3737	0.3356	0.3280	0.2898	0.2898	0.2822	0.3051	0.3280	0.3432	0.3585 (22b)
Effective ac	0.5757	0.5727	0.5698	0.5563	0.5538	0.5420	0.5420	0.5398	0.5465	0.5538	0.5589	0.5643 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			22.0500	0.9615	21.2019		(27)
Solid door			2.1300	1.0000	2.1300		(26a)
Heatloss Floor 1			67.7500	0.0900	6.0975	110.0000	7452.5000 (28a)
Exposed Floor			8.7500	0.0900	0.7875	0.0000	0.0000 (28b)
External Wall 1	50.9000	22.0500	28.8500	0.1300	3.7505	190.0000	5481.5003 (29a)
Corridor Wall	17.4000	2.1300	15.2700	0.1200	1.8324	190.0000	2901.2999 (29a)
Total net area of external elements Aum(A, m ²)			144.8000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.7998		(33)
Main dwelling							
Party Wall 1			24.2600	0.0000	0.0000	180.0000	4366.8000 (32)
Party Floor 1			67.7500			40.0000	2710.0000 (32d)
Party Ceiling 1			76.5000			30.0000	2295.0000 (32b)
Internal Wall 1			101.0400			9.0000	909.3600 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	26116.4603 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							341.3916 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				11.5100	0.0410	0.4719	
E3 Sill				10.5000	0.0060	0.0630	

Full SAP Calculation Printout



E4 Jamb									25.2000	0.0100	0.2520	
E7 Party floor between dwellings (in blocks of flats)									32.3000	0.0000	0.0000	
E16 Corner (normal)									4.8000	0.0340	0.1632	
E18 Party wall between dwellings									4.8000	0.0370	0.1776	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												1.1277 (36)
Point Thermal bridges												0.0000
Total fabric heat loss										(33) + (36) + (36a) =		36.9275 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.8780	34.7000	34.5255	33.7060	33.5526	32.8389	32.8389	32.7067	33.1138	33.5526	33.8628	34.1871 (38)
Average = Sum(39)m / 12 =	71.8055	71.6275	71.4530	70.6335	70.4802	69.7664	69.7664	69.6342	70.0413	70.4802	70.7904	71.1146 (39)
												70.6328
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9386	0.9363	0.9340	0.9233	0.9213	0.9120	0.9120	0.9103	0.9156	0.9213	0.9254	0.9296 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

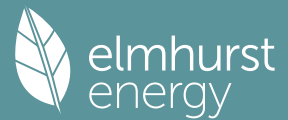
Assumed occupancy												2.3931 (42)
Hot water usage for mixer showers												
	88.4731	87.1435	85.2061	81.4991	78.7634	75.7127	73.9786	75.9014	78.0091	81.2847	85.0713	88.1341 (42a)
Hot water usage for baths												
	27.7933	27.3805	26.7992	25.7275	24.9250	24.0351	23.5545	24.1317	24.7601	25.7123	26.8061	27.6993 (42b)
Hot water usage for other uses												
	39.1377	37.7145	36.2913	34.8682	33.4450	32.0218	32.0218	33.4450	34.8682	36.2913	37.7145	39.1377 (42c)
Average daily hot water use (litres/day)												142.9177 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	155.4041	152.2386	148.2967	142.0947	137.1334	131.7696	129.5548	133.4780	137.6374	143.2884	149.5920	154.9712 (44)
Energy content												
	246.1221	216.7857	227.9264	194.5206	184.6079	162.0261	156.6854	165.2737	169.7207	194.4410	213.1212	242.6474 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2373.8782
	36.9183	32.5179	34.1890	29.1781	27.6912	24.3039	23.5028	24.7911	25.4581	29.1662	31.9682	36.3971 (46)
Water storage loss:												
Store volume												80.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4300 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												0.8580 (55)
Total storage loss												
	26.5980	24.0240	26.5980	25.7400	26.5980	25.7400	26.5980	26.5980	25.7400	26.5980	25.7400	26.5980 (56)
If cylinder contains dedicated solar storage												
	26.5980	24.0240	26.5980	25.7400	26.5980	25.7400	26.5980	26.5980	25.7400	26.5980	25.7400	26.5980 (57)
Primary loss												
	31.1612	28.1456	31.1612	30.1560	31.1612	22.5120	23.2624	23.2624	22.5120	31.1612	30.1560	31.1612 (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												
	303.8813	268.9553	285.6856	250.4166	242.3671	210.2781	206.5458	215.1341	217.9727	252.2002	269.0172	300.4066 (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												
	303.8813	268.9553	285.6856	250.4166	242.3671	210.2781	206.5458	215.1341	217.9727	252.2002	269.0172	300.4066 (64)
Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 3022.8606 (64)
Electric shower(s)												3023 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	128.0430	113.8169	121.9929	109.3949	107.5895	92.4753	91.9862	94.8418	95.0337	110.8590	115.5796	126.8876 (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	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.9148	118.3699	106.9148	110.4786	106.9148	110.4786	106.9148	106.9148	110.4786	106.9148	110.4786	106.9148 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	211.9705	214.1701	208.6272	196.8270	181.9314	167.9317	158.5790	156.3794	161.9223	173.7225	188.6181	202.6178 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655 (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)	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239 (71)
Water heating gains (Table 5)	172.1008	169.3704	163.9690	151.9374	144.6095	128.4379	123.6374	127.4756	131.9913	149.0040	160.5272	170.5479 (72)
Total internal gains	549.8825	560.8070	538.4074	518.1395	492.3522	465.7446	448.0276	449.6662	463.2887	488.5377	518.5204	538.9770 (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	
Northeast				4.4100	11.2829		0.5700		0.7000		0.7700	13.7584 (75)
Southeast				8.8200	36.7938		0.5700		0.7000		0.7700	89.7325 (77)
Southwest				8.8200	36.7938		0.5700		0.7000		0.7700	89.7325 (79)
Solar gains	193.2234	333.7008	468.7227	601.1164	691.8716	695.0372	666.6906	597.7342	514.3760	372.0834	232.2693	164.8204 (83)
Total gains	743.1059	894.5078	1007.1302	1119.2559	1184.2239	1160.7818	1114.7182	1047.4005	977.6647	860.6212	750.7897	703.7974 (84)

Full SAP Calculation Printout



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	101.0309	101.2820	101.5293	102.7072	102.9307	103.9837	103.9837	104.1811	103.5756	102.9307	102.4797	102.0124
alpha	7.7354	7.7521	7.7686	7.8471	7.8620	7.9322	7.9322	7.9454	7.9050	7.8620	7.8320	7.8008
util living area	0.9905	0.9649	0.8981	0.7397	0.5511	0.3845	0.2754	0.3058	0.4934	0.8046	0.9686	0.9933 (86)
Living	20.5705	20.7160	20.8493	20.9378	20.9580	20.9606	20.9608	20.9608	20.9598	20.9262	20.7441	20.5430
Non living	19.7552	19.8959	20.0166	20.0942	20.1087	20.1181	20.1181	20.1196	20.1146	20.0897	19.9330	19.7352
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	20.7803	20.7160	20.8493	20.9378	20.9580	20.9606	20.9608	20.9608	20.9598	20.9262	20.7441	20.6069 (87)
Th 2	20.1348	20.1367	20.1387	20.1477	20.1494	20.1573	20.1573	20.1588	20.1543	20.1494	20.1460	20.1424 (88)
util rest of house	0.9868	0.9532	0.8708	0.6951	0.5017	0.3340	0.2226	0.2499	0.4334	0.7542	0.9560	0.9907 (89)
MIT 2	19.9406	19.8959	20.0166	20.0942	20.1087	20.1181	20.1181	20.1196	20.1146	20.0897	19.9330	19.7921 (90)
Living area fraction												0.3744 (91)
MIT	20.2550	20.2029	20.3284	20.4100	20.4267	20.4335	20.4336	20.4345	20.4311	20.4029	20.2366	20.0972 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2550	20.2029	20.3284	20.4100	20.4267	20.4335	20.4336	20.4345	20.4311	20.4029	20.2366	20.0972 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9874	0.9542	0.8773	0.7092	0.5179	0.3506	0.2399	0.2682	0.4531	0.7700	0.9575	0.9905 (94)
Useful gains	733.7184	853.5576	883.5723	793.7535	613.3397	406.9175	267.4515	280.9362	442.9677	662.6425	718.9098	697.1075 (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	1145.6552	1096.1096	988.0787	812.9929	615.0582	406.9823	267.4540	280.9421	443.4359	690.9075	929.9465	1130.5222 (97)
Space heating kWh	306.4810	162.9949	77.7528	13.8524	1.2785	0.0000	0.0000	0.0000	0.0000	21.0292	151.9464	322.4605 (98a)
Space heating requirement - total per year (kWh/year)												1057.7958
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	306.4810	162.9949	77.7528	13.8524	1.2785	0.0000	0.0000	0.0000	0.0000	21.0292	151.9464	322.4605 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1057.7958
Space heating per m2										(98c) / (4) =		13.8274 (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 %)												231.7468 (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	306.4810	162.9949	77.7528	13.8524	1.2785	0.0000	0.0000	0.0000	0.0000	21.0292	151.9464	322.4605 (98)
Space heating efficiency (main heating system 1)	231.7468	231.7468	231.7468	231.7468	231.7468	0.0000	0.0000	0.0000	0.0000	231.7468	231.7468	231.7468 (210)
Space heating fuel (main heating system)	132.2482	70.3332	33.5507	5.9774	0.5517	0.0000	0.0000	0.0000	0.0000	9.0742	65.5657	139.1435 (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	303.8813	268.9553	285.6856	250.4166	242.3671	210.2781	206.5458	215.1341	217.9727	252.2002	269.0172	300.4066 (64)
Efficiency of water heater												181.6418 (216)
(217)m	181.6418	181.6418	181.6418	181.6418	181.6418	181.6418	181.6418	181.6418	181.6418	181.6418	181.6418	181.6418 (217)
Fuel for water heating, kWh/month	167.2970	148.0690	157.2797	137.8629	133.4313	115.7652	113.7105	118.4386	120.0014	138.8448	148.1031	165.3841 (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	21.7607	17.4573	15.7183	11.5159	8.8952	7.2675	8.1145	10.5476	13.7002	17.9755	20.3032	22.3655 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-6.9058	-12.1919	-22.2612	-30.8572	-38.3125	-37.5662	-36.7474	-31.8167	-24.0502	-15.6496	-8.2417	-5.6413 (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												456.4446 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												181.6418
Water heating fuel used												1664.1876 (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)												175.6215 (232)

Full SAP Calculation Printout



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

PV generation	-270.2416	(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	2026.0121	(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	456.4446	0.1592	72.6855 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1664.1876	0.1412	234.9746 (264)
Space and water heating			307.6601 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	175.6215	0.1443	25.3476 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-270.2416	0.1307	-35.3290
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-35.3290 (269)
Total CO2, kg/year			297.6788 (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	456.4446	1.5894	725.4608 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1664.1876	1.5221	2533.0694 (278)
Space and water heating			3258.5303 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	175.6215	1.5338	269.3741 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-270.2416	1.4829	-400.7511
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-400.7511 (283)
Total Primary energy kWh/year			3127.1533 (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)
Main dwelling	76.5000 (1b)	x 2.4000 (2b)	= 183.6000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	183.6000 (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	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) = 0.1634 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4134 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3514 (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	0.4480	0.4392	0.4305	0.3865	0.3777	0.3338	0.3338	0.3250	0.3514	0.3777	0.3953	0.4129 (22b)
Effective ac	0.6004	0.5965	0.5926	0.5747	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

Full SAP Calculation Printout



3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			2.1300	1.0000	2.1300			(26a)
TER Opening Type			17.0000	1.1450	19.4656			(27)
Heatloss Floor 1			67.7500	0.1300	8.8075			(28a)
Exposed Floor			8.7500	0.1300	1.1375			(28b)
External Wall 1	50.9000	17.0000	33.9000	0.1800	6.1020			(29a)
Corridor Wall	17.4000	2.1300	15.2700	0.1800	2.7486			(29a)
Total net area of external elements Aum(A, m2)			144.8000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		40.3912			(33)
Main dwelling								
Party Wall 1			24.2600	0.0000	0.0000			(32)

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

351.3916 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	11.5100	0.0500	0.5755	
E3 Sill	10.5000	0.0500	0.5250	
E4 Jamb	25.2000	0.0500	1.2600	
E7 Party floor between dwellings (in blocks of flats)	32.3000	0.0700	2.2610	
E16 Corner (normal)	4.8000	0.0900	0.4320	
E18 Party wall between dwellings	4.8000	0.0600	0.2880	

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

5.3415 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 45.7327 (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	36.3747	36.1386	35.9071	34.8200	34.6166	33.6698	33.6698	33.4945	34.0345	34.6166	35.0281	35.4583	(38)
Heat transfer coeff	82.1074	81.8713	81.6399	80.5528	80.3494	79.4026	79.4026	79.2272	79.7673	80.3494	80.7609	81.1910	(39)
Average = Sum(39)m / 12 =												80.5518	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0733	1.0702	1.0672	1.0530	1.0503	1.0379	1.0379	1.0357	1.0427	1.0503	1.0557	1.0613	(40)
HLP (average)												1.0530	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

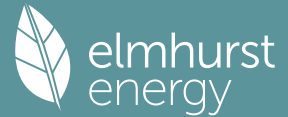
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3931 (42)
Hot water usage for mixer showers													
64.3441	63.3771	61.9681	59.2721	57.2825	55.0638	53.8026	55.2010	56.7339	59.1162	61.8701	64.0976	64.0976	(42a)
Hot water usage for baths													
27.7933	27.3805	26.7992	25.7275	24.9250	24.0351	23.5545	24.1317	24.7601	25.7123	26.8061	27.6993	27.6993	(42b)
Hot water usage for other uses													
39.1377	37.7145	36.2913	34.8682	33.4450	32.0218	32.0218	33.4450	34.8682	36.2913	37.7145	39.1377	39.1377	(42c)
Average daily hot water use (litres/day)													120.6716 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	131.2751	128.4722	125.0586	119.8677	115.6525	111.1207	109.3789	112.7776	116.3622	121.1198	126.3907	130.9346	(44)
Energy conte	207.9076	182.9426	192.2105	164.0929	155.6904	136.6358	132.2843	139.6423	143.4862	164.3585	180.0668	205.0119	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
31.1861	27.4414	28.8316	24.6139	23.3536	20.4954	19.8426	20.9463	21.5229	24.6538	27.0100	30.7518	30.7518	(46)
Water storage loss:													
Store volume													80.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													0.9749 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.5264 (55)
Total storage loss													
16.3190	14.7398	16.3190	15.7926	16.3190	15.7926	16.3190	16.3190	15.7926	16.3190	15.7926	16.3190	16.3190	(56)
If cylinder contains dedicated solar storage													
16.3190	14.7398	16.3190	15.7926	16.3190	15.7926	16.3190	16.3190	15.7926	16.3190	15.7926	16.3190	16.3190	(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													
247.4891	218.6936	231.7919	202.3975	195.2718	174.9404	171.8657	179.2237	181.7908	203.9399	218.3714	244.5933	244.5933	(62)
WWHRS	-29.4154	-26.0152	-27.2417	-22.5572	-21.0225	-17.9891	-16.8619	-17.9309	-18.6122	-21.9417	-24.8573	-28.8707	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Output from w/h	218.0736	192.6784	204.5502	179.8403	174.2494	156.9513	155.0038	161.2928	163.1786	181.9982	193.5140	215.7226	(64)
Total per year (kWh/year)													2197.0533 (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	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													
100.7944	89.4292	95.5751	85.2046	83.4322	76.0751	75.6496	78.0962	78.3528	86.3143	90.5159	99.8316	99.8316	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
106.9223	118.3782	106.9223	110.4863	106.9223	110.4863	106.9223	106.9223	110.4863	106.9223	110.4863	106.9223	106.9223	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
211.9705	214.1701	208.6272	196.8270	181.9314	167.9317	158.5790	156.3794	161.9223	173.7225	188.6181	202.6178	202.6178	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	(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)													
-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	(71)
Water heating gains (Table 5)													
135.4764	133.0792	128.4612	118.3397	112.1401	105.6598	101.6796	104.9680	108.8234	116.0139	125.7165	134.1823	134.1823	(72)

Full SAP Calculation Printout



Total internal gains
516.2656 527.5240 505.9071 487.5495 462.8902 442.9743 426.0773 427.1661 440.1285 458.5551 486.7174 505.6188 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Northeast					3.4000	11.2829	0.6300	0.7000	0.7700		11.7239 (75)	
Southeast					6.8000	36.7938	0.6300	0.7000	0.7700		76.4638 (77)	
Southwest					6.8000	36.7938	0.6300	0.7000	0.7700		76.4638 (79)	
Solar gains	164.6515	284.3566	399.4128	512.2296	589.5648	592.2623	568.1072	509.3475	438.3154	317.0636	197.9237	140.4485 (83)
Total gains	680.9171	811.8806	905.3200	999.7791	1052.4550	1035.2366	994.1846	936.5136	878.4439	775.6186	684.6411	646.0673 (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 90.9427	Feb 91.2050	Mar 91.4635	Apr 92.6979	May 92.9325	Jun 94.0407	Jul 94.0407	Aug 94.2488	Sep 93.6107	Oct 92.9325	Nov 92.4591	Dec 91.9692
alpha	7.0628	7.0803	7.0976	7.1799	7.1955	7.2694	7.2694	7.2833	7.2407	7.1955	7.1639	7.1313
util living area	0.9964	0.9873	0.9604	0.8663	0.6914	0.4895	0.3513	0.3889	0.6185	0.9081	0.9885	0.9974 (86)
MIT	20.2571	20.4458	20.6627	20.8832	20.9789	20.9984	20.9999	20.9998	20.9923	20.8587	20.5207	20.2270 (87)
Th 2	20.0227	20.0252	20.0277	20.0394	20.0416	20.0518	20.0518	20.0537	20.0479	20.0416	20.0372	20.0325 (88)
util rest of house	0.9948	0.9821	0.9450	0.8254	0.6276	0.4177	0.2757	0.3091	0.5372	0.8680	0.9828	0.9963 (89)
MIT 2	19.1784	19.4181	19.6850	19.9400	20.0282	20.0512	20.0518	20.0537	20.0444	19.9238	19.5240	19.1479 (90)
Living area fraction	19.5822	19.8029	20.0510	20.2931	20.3841	20.4058	20.4067	20.4079	20.3993	20.2738	19.8972	19.5519 (92)
MIT	19.5822	19.8029	20.0510	20.2931	20.3841	20.4058	20.4067	20.4079	20.3993	20.2738	19.8972	19.5519 (93)
Temperature adjustment												0.0000
adjusted MIT	19.5822	19.8029	20.0510	20.2931	20.3841	20.4058	20.4067	20.4079	20.3993	20.2738	19.8972	19.5519 (93)

8. Space heating requirement

Utilisation	Jan 0.9939	Feb 0.9806	Mar 0.9455	Apr 0.8371	May 0.6510	Jun 0.4446	Jul 0.3040	Aug 0.3390	Sep 0.5677	Oct 0.8789	Nov 0.9817	Dec 0.9955 (94)
Useful gains	676.7342	796.1085	855.9474	836.8753	685.1105	460.2828	302.2289	317.4527	498.6716	681.7078	672.1141	643.1840 (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	1254.7843	1220.1172	1106.3030	917.7461	697.7643	460.9978	302.2656	317.5323	502.4764	777.2842	1033.5114	1246.4363 (97)
Space heating kWh	430.0693	284.9338	186.2646	58.2270	9.4144	0.0000	0.0000	0.0000	0.0000	71.1088	260.2061	448.8197 (98a)
Space heating requirement - total per year (kWh/year)												1749.0437
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	430.0693	284.9338	186.2646	58.2270	9.4144	0.0000	0.0000	0.0000	0.0000	71.1088	260.2061	448.8197 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1749.0437
Space heating per m2										(98c) / (4) =		22.8633 (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 430.0693	Feb 284.9338	Mar 186.2646	Apr 58.2270	May 9.4144	Jun 0.0000	Jul 0.0000	Aug 0.0000	Sep 0.0000	Oct 71.1088	Nov 260.2061	Dec 448.8197 (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)	465.9473	308.7040	201.8034	63.0845	10.1998	0.0000	0.0000	0.0000	0.0000	77.0410	281.9134	486.2619 (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	218.0736	192.6784	204.5502	179.8403	174.2494	156.9513	155.0038	161.2928	163.1786	181.9982	193.5140	215.7226 (64)
Efficiency of water heater	85.5535	84.9356	83.8504	81.8284	80.2167	79.8000	79.8000	79.8000	79.8000	82.1388	84.7246	79.8000 (216)
Fuel for water heating, kWh/month	254.8973	226.8524	243.9467	219.7774	217.2232	196.6809	194.2403	202.1213	204.4845	221.5739	228.4037	251.8249 (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	22.2163	17.8228	16.0474	11.7570	9.0815	7.4196	8.2844	10.7684	13.9871	18.3518	20.7283	22.8338 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-25.9106	-37.6493	-55.7603	-64.6630	-71.4281	-67.2862	-66.4555	-61.8937	-54.1360	-43.9202	-28.8789	-22.2719 (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)												

Full SAP Calculation Printout



(233b)m	-11.4264	-24.3424	-48.9526	-74.3637	-99.1502	-99.9258	-98.7562	-83.2467	-60.5269	-35.0961	-15.3472	-9.0136	(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												1894.9552	(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												2662.0263	(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)												179.2985	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1260.4014	(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												3561.8787	(238)

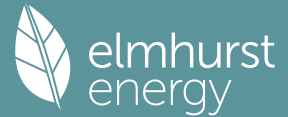
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1894.9552	0.2100	397.9406 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2662.0263	0.2100	559.0255 (264)
Space and water heating			956.9661 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	179.2985	0.1443	25.8783 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-600.2537	0.1340	-80.4057
PV Unit electricity exported	-660.1476	0.1256	-82.8896
Total			-163.2953 (269)
Total CO2, kg/year			831.4784 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8700 (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	1894.9552	1.1300	2141.2994 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2662.0263	1.1300	3008.0897 (278)
Space and water heating			5149.3891 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	179.2985	1.5338	275.0141 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-600.2537	1.4950	-897.3983
PV Unit electricity exported	-660.1476	0.4609	-304.2512
Total			-1201.6495 (283)
Total Primary energy kWh/year			4352.8545 (286)
Target Primary Energy Rate (TPER)			56.9000 (287)

Full SAP Calculation Printout



Property Reference	Be Green ASHP				Issued on Date	24/10/2025
Assessment Reference	Flat 3	Prop Type Ref		Baseline		
Property						
SAP Rating	86 B	DER	3.76	TER	12.45	
Environmental	97 A	% DER < TER				69.80
CO ₂ Emissions (t/year)	0.22	DFEE	25.83	TFEE	33.98	
Compliance Check	See BREL	% DFEE < TFEE				23.99
% DPER < TPER	40.03	DPER	39.27	TPER	65.49	
Assessor Details	Mr. Neil Bradford				Assessor ID	T704-0001
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)
Main dwelling			
Ground floor	66.9000 (1b)	2.4000 (2b)	160.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9000		160.5600 (4)
Dwelling volume			160.5600 (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) = 0.1246 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3746 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3184 (21)

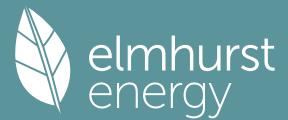
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4059	0.3980	0.3900	0.3502	0.3423	0.3025	0.3025	0.2945	0.3184	0.3423	0.3582	0.3741 (22b)
Effective ac	0.5824	0.5792	0.5761	0.5613	0.5586	0.5457	0.5457	0.5434	0.5507	0.5586	0.5641	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			17.4300	0.9615	16.7596		(27)
Solid door			2.1300	1.0000	2.1300		(26a)
Heatloss Floor 1			66.9000	0.0900	6.0210	110.0000	7359.0000 (28b)
External Wall 1	49.4600	17.4300	32.0300	0.1300	4.1639	190.0000	6085.6998 (29a)
Corridor Wall	14.8200	2.1300	12.6900	0.1200	1.5228	190.0000	2411.0999 (29a)
Total net area of external elements Aum(A, m ²)			131.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.5973		(33)
Main dwelling							
Party Wall 1			21.1100	0.0000	0.0000	180.0000	3799.8001 (32)
Party Ceiling 1			66.9000			30.0000	2007.0000 (32b)
Internal Wall 1			77.6900			9.0000	699.2100 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	22361.8099 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							334.2572 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				10.1100	0.0410	0.4145	
E3 Sill				9.1000	0.0060	0.0546	
E4 Jamb				23.1000	0.0100	0.2310	
E7 Party floor between dwellings (in blocks of flats)				31.4500	0.0000	0.0000	

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	99.3920	99.6623	99.9288	101.1993	101.4407	102.5794	102.5794	102.7931	102.1378	101.4407	100.9537	100.4495
alpha	7.6261	7.6442	7.6619	7.7466	7.7627	7.8386	7.8386	7.8529	7.8092	7.7627	7.7302	7.6966
util living area												
	0.9951	0.9848	0.9504	0.8200	0.6133	0.4236	0.3053	0.3476	0.5778	0.8881	0.9848	0.9964 (86)
Living	20.4987	20.6194	20.7692	20.9122	20.9547	20.9600	20.9603	20.9603	20.9576	20.8871	20.6732	20.4795
Non living	19.6888	19.8088	19.9520	20.0815	20.1118	20.1233	20.1234	20.1251	20.1190	20.0673	19.8715	19.6773
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	20.7435	20.6194	20.7692	20.9122	20.9547	20.9600	20.9603	20.9603	20.9576	20.8871	20.6732	20.5523 (87)
Th 2	20.1386	20.1407	20.1428	20.1527	20.1545	20.1631	20.1631	20.1647	20.1598	20.1545	20.1508	20.1469 (88)
util rest of house												
	0.9932	0.9791	0.9335	0.7785	0.5599	0.3683	0.2472	0.2845	0.5093	0.8475	0.9780	0.9949 (89)
MIT 2	19.9085	19.8088	19.9520	20.0815	20.1118	20.1233	20.1234	20.1251	20.1190	20.0673	19.8715	19.7430 (90)
Living area fraction												
										fLA = Living area / (4) =		0.4734 (91)
MIT	20.3038	20.1926	20.3389	20.4747	20.5108	20.5194	20.5196	20.5205	20.5160	20.4554	20.2510	20.1261 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3038	20.1926	20.3389	20.4747	20.5108	20.5194	20.5196	20.5205	20.5160	20.4554	20.2510	20.1261 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9936	0.9795	0.9378	0.7949	0.5826	0.3919	0.2719	0.3114	0.5385	0.8631	0.9789	0.9949 (94)
Useful gains	572.5447	652.9970	697.9656	672.9997	535.9441	358.3046	237.3408	248.9757	388.7195	546.9191	559.9744	548.5813 (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	1000.1746	953.1332	860.2295	710.4573	539.5223	358.4460	237.3472	248.9937	390.1963	603.4844	809.1732	984.8428 (97)
Space heating kWh	318.1566	201.6915	120.7243	26.9695	2.6622	0.0000	0.0000	0.0000	0.0000	42.0846	179.4231	324.5786 (98a)
Space heating requirement - total per year (kWh/year)												1216.2904
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	318.1566	201.6915	120.7243	26.9695	2.6622	0.0000	0.0000	0.0000	0.0000	42.0846	179.4231	324.5786 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1216.2904
Space heating per m2										(98c) / (4) =		18.1807 (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 %)												225.8224 (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	318.1566	201.6915	120.7243	26.9695	2.6622	0.0000	0.0000	0.0000	0.0000	42.0846	179.4231	324.5786 (98)
Space heating efficiency (main heating system 1)	225.8224	225.8224	225.8224	225.8224	225.8224	0.0000	0.0000	0.0000	0.0000	225.8224	225.8224	225.8224 (210)
Space heating fuel (main heating system)	140.8880	89.3142	53.4598	11.9428	1.1789	0.0000	0.0000	0.0000	0.0000	18.6361	79.4532	143.7317 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	226.6952	200.6791	213.7477	189.3126	184.4402	159.5666	157.8855	163.9118	165.4318	191.7762	202.4222	224.4059 (64)
Efficiency of water heater (217)m	182.4549	182.4549	182.4549	182.4549	182.4549	182.4549	182.4549	182.4549	182.4549	182.4549	182.4549	182.4549 (216)
Fuel for water heating, kWh/month	124.2473	109.9883	117.1510	103.7586	101.0881	87.4554	86.5340	89.8369	90.6699	105.1089	110.9437	122.9925 (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	21.1546	16.9710	15.2805	11.1952	8.6475	7.0651	7.8885	10.2538	13.3186	17.4748	19.7377	21.7426 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-6.8604	-12.0863	-21.9584	-30.0831	-37.0323	-36.2101	-35.4510	-30.7886	-23.3986	-15.4109	-8.1769	-5.6061 (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												538.6047 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												182.4549
Water heating fuel used												1249.7745 (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)												170.7298 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-263.0626 (233)

Full SAP Calculation Printout



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	1696.0464 (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	538.6047	0.1583	85.2580 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1249.7745	0.1410	176.2741 (264)
Space and water heating			261.5321 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	170.7298	0.1443	24.6416 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-263.0626	0.1309	-34.4294
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-34.4294 (269)
Total CO2, kg/year			251.7443 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	538.6047	1.5859	854.1930 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1249.7745	1.5215	1901.5872 (278)
Space and water heating			2755.7803 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	170.7298	1.5338	261.8710 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-263.0626	1.4835	-390.2519
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-390.2519 (283)
Total Primary energy kWh/year			2627.3993 (286)
Dwelling Primary energy Rate (DPER)			39.2700 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	66.9000 (1b)	x 2.4000 (2b)	= 160.5600 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	160.5600 (5)

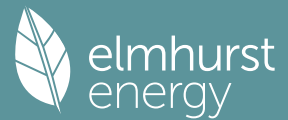
2. Ventilation rate

	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) =	0.1246 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3746	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3184	(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	1.1750	1.1750 (22a)
Adj infilt rate	0.4059	0.3980	0.3900	0.3502	0.3423	0.3025	0.3025	0.2945	0.3184	0.3423	0.3582	0.3741 (22b)
Effective ac	0.5824	0.5792	0.5761	0.5613	0.5586	0.5457	0.5457	0.5434	0.5507	0.5586	0.5641	0.5700 (25)

Full SAP Calculation Printout



3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			2.1300	1.0000	2.1300			(26a)
TER Opening Type			14.6000	1.1450	16.7176			(27)
Heatloss Floor 1			66.9000	0.1300	8.6970			(28b)
External Wall 1	49.4600	14.6000	34.8600	0.1800	6.2748			(29a)
Corridor Wall	14.8200	2.1300	12.6900	0.1800	2.2842			(29a)
Total net area of external elements Aum(A, m2)			131.1800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.1036		(33)
Main dwelling								
Party Wall 1			21.1100	0.0000	0.0000			(32)

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

344.2572 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	10.1100	0.0500	0.5055	
E3 Sill	9.1000	0.0500	0.4550	
E4 Jamb	23.1000	0.0500	1.1550	
E7 Party floor between dwellings (in blocks of flats)	31.4500	0.0700	2.2015	
E16 Corner (normal)	4.8000	0.0900	0.4320	
E18 Party wall between dwellings	4.8000	0.0600	0.2880	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.0370 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		41.1406 (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	30.8579	30.6884	30.5222	29.7418	29.5957	28.9160	28.9160	28.7901	29.1778	29.5957	29.8911	30.2000	(38)
Average = Sum(39)m / 12 =	71.9984	71.8289	71.6628	70.8823	70.7363	70.0565	70.0565	69.9307	70.3184	70.7363	71.0317	71.3405	(39)
												70.8816	
HLP	1.0762	1.0737	1.0712	1.0595	1.0573	1.0472	1.0472	1.0453	1.0511	1.0573	1.0618	1.0664	(40)
HLP (average)												1.0595	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

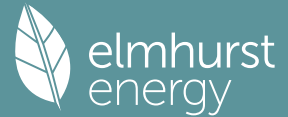
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1686 (42)
Hot water usage for mixer showers													
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	(42a)
Hot water usage for baths													
69.8296	68.7925	67.3321	64.6394	62.6231	60.3874	59.1797	60.6299	62.2089	64.6012	67.3494	69.5935	69.5935	(42b)
Hot water usage for other uses													
36.8384	35.4988	34.1592	32.8197	31.4801	30.1405	30.1405	31.4801	32.8197	34.1592	35.4988	36.8384	36.8384	(42c)
Average daily hot water use (litres/day)												98.2325	(43)
Daily hot water use													
106.6680	104.2914	101.4914	97.4591	94.1032	90.5279	89.3202	92.1100	95.0286	98.7605	102.8482	106.4319	106.4319	(44)
Energy conte	168.9360	148.5095	155.9885	133.4166	126.6810	111.3146	108.0251	114.0514	117.1798	134.0170	146.5262	166.6467	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m	25.3404	22.2764	23.3983	20.0125	19.0021	16.6972	16.2038	17.1077	17.5770	20.1026	21.9789	24.9970	(46)
Water storage loss:													
Store volume												80.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9749	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.5264	(55)
Total storage loss													
16.3190	14.7398	16.3190	15.7926	16.3190	15.7926	16.3190	16.3190	15.7926	16.3190	15.7926	16.3190	16.3190	(56)
If cylinder contains dedicated solar storage													
16.3190	14.7398	16.3190	15.7926	16.3190	15.7926	16.3190	16.3190	15.7926	16.3190	15.7926	16.3190	16.3190	(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													
208.5175	184.2605	195.5699	171.7212	166.2624	149.6192	147.6065	153.6329	155.4843	173.5985	184.8308	206.2281	206.2281	(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	208.5175	184.2605	195.5699	171.7212	166.2624	149.6192	147.6065	153.6329	155.4843	173.5985	184.8308	206.2281	(64)
12Total per year (kWh/year)												2097.3316	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	87.8364	77.9802	83.5313	75.0047	73.7866	67.6558	67.5835	69.5872	69.6059	76.2258	79.3636	87.0752	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	95.8715	106.1435	95.8715	99.0673	95.8715	99.0673	95.8715	95.8715	99.0673	95.8715	99.0673	95.8715	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	189.9565	191.9277	186.9604	176.3858	163.0371	150.4913	142.1099	140.1388	145.1060	155.6807	169.0293	181.5751	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	33.8429	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	-86.7431	(71)
Water heating gains (Table 5)	118.0596	116.0419	112.2732	104.1732	99.1755	93.9664	90.8380	93.5312	96.6749	102.4540	110.2273	117.0365	(72)
Total internal gains	462.4164	472.6418	453.6339	438.1549	416.6128	399.0536	384.3481	385.0702	396.3769	412.5349	436.8525	453.0119	(73)

Full SAP Calculation Printout



6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast				2.1100	11.2829	0.6300	0.7000	0.7700	7.2757	(75)
Southwest				5.1000	36.7938	0.6300	0.7000	0.7700	57.3478	(79)
Northwest				7.3900	11.2829	0.6300	0.7000	0.7700	25.4823	(81)
Solar gains	90.1059	164.3645	253.7923	362.9045	450.7002	466.8906	442.0383	373.5652	291.1091	189.4504
Total gains	552.5222	637.0063	707.4262	801.0593	867.3130	865.9441	826.3864	758.6354	687.4860	601.9853

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	88.8554	89.0651	89.2716	90.2545	90.4408	91.3183	91.3183	91.4827	90.9783	90.4408	90.0647	89.6748
alpha	6.9237	6.9377	6.9514	7.0170	7.0294	7.0879	7.0879	7.0988	7.0652	7.0294	7.0043	6.9783
util living area	0.9975	0.9928	0.9769	0.9030	0.7290	0.5154	0.3728	0.4235	0.6869	0.9445	0.9928	0.9981 (86)
MIT	20.1877	20.3461	20.5656	20.8321	20.9681	20.9974	20.9998	20.9995	20.9838	20.7911	20.4444	20.1623 (87)
Th 2	20.0203	20.0224	20.0244	20.0340	20.0358	20.0442	20.0442	20.0458	20.0410	20.0358	20.0322	20.0284 (88)
util rest of house	0.9964	0.9897	0.9670	0.8686	0.6647	0.4397	0.2919	0.3360	0.6005	0.9158	0.9891	0.9973 (89)
MIT 2	19.0899	19.2926	19.5678	19.8842	20.0148	20.0432	20.0442	20.0456	20.0330	19.8494	19.4263	19.0639 (90)
Living area fraction	19.6096	19.7913	20.0401	20.3329	20.4660	20.4949	20.4965	20.4972	20.4831	20.2952	19.9083	19.5838 (91)
MIT	19.6096	19.7913	20.0401	20.3329	20.4660	20.4949	20.4965	20.4972	20.4831	20.2952	19.9083	19.5838 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6096	19.7913	20.0401	20.3329	20.4660	20.4949	20.4965	20.4972	20.4831	20.2952	19.9083	19.5838 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9958	0.9887	0.9672	0.8803	0.6943	0.4756	0.3302	0.3774	0.6414	0.9247	0.9885	0.9968 (94)
Useful gains	550.2028	629.8186	684.2373	705.1526	602.1559	411.8387	272.9069	286.3407	440.9336	556.6335	540.4901	527.1573 (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	1102.2670	1069.6264	970.3229	810.3933	620.0778	412.9774	272.9781	286.5182	448.8501	685.7992	909.7928	1097.4916 (97)
Space heating kWh	410.7358	295.5508	212.8476	75.7733	13.3339	0.0000	0.0000	0.0000	0.0000	96.0993	265.8979	424.3287 (98a)
Space heating requirement - total per year (kWh/year)												1794.5673
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	410.7358	295.5508	212.8476	75.7733	13.3339	0.0000	0.0000	0.0000	0.0000	96.0993	265.8979	424.3287 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1794.5673
Space heating per m2										(98c) / (4) =		26.8246 (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	410.7358	295.5508	212.8476	75.7733	13.3339	0.0000	0.0000	0.0000	0.0000	96.0993	265.8979	424.3287 (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)	445.0008	320.2067	230.6042	82.0946	14.4462	0.0000	0.0000	0.0000	0.0000	104.1163	288.0801	459.7278 (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	208.5175	184.2605	195.5699	171.7212	166.2624	149.6192	147.6065	153.6329	155.4843	173.5985	184.8308	206.2281 (64)
Efficiency of water heater	85.5511	85.1136	84.2500	82.3555	80.4050	79.8000	79.8000	79.8000	79.8000	82.7899	84.8747	79.8000 (216)
Fuel for water heating, kWh/month	243.7345	216.4876	232.1303	208.5121	206.7811	187.4927	184.9706	192.5224	194.8425	209.6857	217.7691	85.6410 (217)
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	240.8052 (219)
(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	19.9202	15.9807	14.3889	10.5419	8.1429	6.6528	7.4282	9.6555	12.5415	16.4551	18.5860	20.4739 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-22.7958	-33.1961	-49.2758	-57.2837	-63.4091	-59.7934	-59.0686	-54.9566	-47.9726	-38.7997	-25.4373	-19.5872 (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)	-9.8558	-21.0162	-42.2967	-64.2966	-85.7633	-86.4351	-85.4106	-71.9701	-52.3012	-30.3008	-13.2389	-7.7722 (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)

Full SAP Calculation Printout



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	(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	(235d)
Annual totals kWh/year										
Space heating fuel - main system 1									1944.2767	(211)
Space heating fuel - main system 2									0.0000	(213)
Space heating fuel - secondary									0.0000	(215)
Efficiency of water heater									79.8000	
Water heating fuel used									2535.7338	(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)									160.7675	(232)
Energy saving/generation technologies (Appendices M ,N and Q)										
PV generation									-1102.2334	(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									3624.5446	(238)

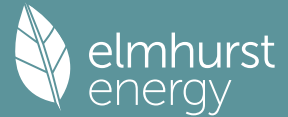
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1944.2767	0.2100	408.2981 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2535.7338	0.2100	532.5041 (264)
Space and water heating			940.8022 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	160.7675	0.1443	23.2037 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-531.5759	0.1339	-71.1780
PV Unit electricity exported	-570.6575	0.1255	-71.6438
Total			-142.8218 (269)
Total CO2, kg/year			833.1134 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.4500 (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	1944.2767	1.1300	2197.0326 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2535.7338	1.1300	2865.3792 (278)
Space and water heating			5062.4119 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	160.7675	1.5338	246.5906 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-531.5759	1.4948	-794.6170
PV Unit electricity exported	-570.6575	0.4608	-262.9729
Total			-1057.5898 (283)
Total Primary energy kWh/year			4381.5134 (286)
Target Primary Energy Rate (TPER)			65.4900 (287)

Full SAP Calculation Printout



Property Reference	Be Green ASHP				Issued on Date	24/10/2025
Assessment Reference	Flat 4		Prop Type Ref	Baseline		
Property						
SAP Rating	82 B	DER	4.18	TER	11.68	
Environmental	96 A	% DER < TER				64.21
CO ₂ Emissions (t/year)	0.35	DFEE	32.01	TFEE	38.05	
Compliance Check	See BREL	% DFEE < TFEE				15.88
% DPER < TPER	28.74	DPER	43.61	TPER	61.20	
Assessor Details	Mr. Neil Bradford				Assessor ID	T704-0001
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)
Main dwelling			
Ground floor	47.2200 (1b)	x 2.4000 (2b)	= 113.3280 (1b) - (3b)
First floor	47.2200 (1c)	x 2.4000 (2c)	= 113.3280 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 226.6560 (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) =	Air changes per hour 20.0000 / (5) = 0.0882 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3382 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2875 (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	0.3666	0.3594	0.3522	0.3163	0.3091	0.2731	0.2731	0.2659	0.2875	0.3091	0.3234	0.3378 (22b)
Effective ac	0.5672	0.5646	0.5620	0.5500	0.5478	0.5373	0.5373	0.5354	0.5413	0.5478	0.5523	0.5571 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			35.9600	0.9615	34.5769		(27)
Solid door			2.1300	1.0000	2.1300		(26a)
GF Ext Wall	58.0100	17.9800	40.0300	0.1300	5.2039	190.0000	7605.6997 (29a)
1F Ext wall	58.0100	17.9800	40.0300	0.1300	5.2039	190.0000	7605.6997 (29a)
GF Exposed Wall	25.6300	2.1300	23.5000	0.1200	2.8200	190.0000	4464.9998 (29a)
1F Exposed Wall	25.6300		25.6300	0.1200	3.0756	190.0000	4869.6998 (29a)
Total net area of external elements Aum(A, m ²)			167.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	53.0103		(33)
Main dwelling							
Party Wall 1			8.2300	0.0000	0.0000	180.0000	1481.3999 (32)
Party Floor 1			47.2200			40.0000	1888.8000 (32d)
Party Ceiling 1			47.2200			30.0000	1416.6000 (32b)
GF Int Wall			52.1500			9.0000	469.3500 (32c)
1F Int Wall			57.1100			9.0000	513.9900 (32c)
Internal Floor 1			47.2200			18.0000	849.9600 (32d)
Internal Ceiling 1			47.2200			9.0000	424.9800 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 31591.1790 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 334.5106 (35)

Full SAP Calculation Printout



List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	18.1400	0.0410	0.7437
E3 Sill	17.1200	0.0060	0.1027
E4 Jamb	54.6000	0.0100	0.5460
E6 Intermediate floor within a dwelling	34.8500	0.0060	0.2091
E7 Party floor between dwellings (in blocks of flats)	34.8500	0.0000	0.0000
E16 Corner (normal)	9.6000	0.0340	0.3264
E18 Party wall between dwellings	9.6000	0.0370	0.3552

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

Point Thermal Bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	55.2935 (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	42.4235	42.2284	42.0371	41.1387	40.9706	40.1881	40.1881	40.0432	40.4895	40.9706	41.3106	41.6661 (38)
Heat transfer coeff	97.7170	97.5218	97.3306	96.4322	96.2641	95.4816	95.4816	95.3367	95.7830	96.2641	96.6041	96.9596 (39)
Average = Sum(39)m / 12 =												96.4314

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0347	1.0326	1.0306	1.0211	1.0193	1.0110	1.0110	1.0095	1.0142	1.0193	1.0229	1.0267 (40)
HLP (average)												1.0211
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6818 (42)
Hot water usage for mixer showers	95.1279	93.6983	91.6151	87.6293	84.6879	81.4077	79.5432	81.6106	83.8769	87.3989	91.4703	94.7634 (42a)
Hot water usage for baths	29.8746	29.4309	28.8061	27.6541	26.7915	25.8350	25.3183	25.9388	26.6143	27.6378	28.8135	29.7736 (42b)
Hot water usage for other uses	42.0938	40.5631	39.0325	37.5018	35.9711	34.4404	34.4404	35.9711	37.5018	39.0325	40.5631	42.0938 (42c)
Average daily hot water use (litres/day)												153.6703 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	167.0963	163.6924	159.4537	152.7852	147.4505	141.6830	139.3019	143.5204	147.9929	154.0691	160.8469	166.6308 (44)
Energy content (annual)	264.6397	233.0957	245.0744	209.1553	198.4967	174.2158	168.4736	177.7083	182.4901	209.0703	229.1559	260.9036 (45)
Distribution loss (46)m = 0.15 x (45)m	39.6960	34.9644	36.7612	31.3733	29.7745	26.1324	25.2710	26.6562	27.3735	31.3605	34.3734	39.1355 (46)
Water storage loss:												
Store volume												80.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4300 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												0.8580 (55)
Total storage loss	26.5980	24.0240	26.5980	25.7400	26.5980	25.7400	26.5980	26.5980	25.7400	26.5980	25.7400	26.5980 (56)
If cylinder contains dedicated solar storage	26.5980	24.0240	26.5980	25.7400	26.5980	25.7400	26.5980	26.5980	25.7400	26.5980	25.7400	26.5980 (57)
Primary loss	31.1612	28.1456	31.1612	30.1560	31.1612	22.5120	23.2624	23.2624	22.5120	31.1612	30.1560	31.1612 (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	322.3989	285.2653	302.8336	265.0513	256.2559	222.4678	218.3340	227.5687	230.7421	266.8295	285.0519	318.6628 (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	322.3989	285.2653	302.8336	265.0513	256.2559	222.4678	218.3340	227.5687	230.7421	266.8295	285.0519	318.6628 (64)
12Total per year (kWh/year)												3201.4617 (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	134.2001	119.2400	127.6946	114.2609	112.2075	96.5284	95.9058	98.9763	99.2795	115.7232	120.9111	132.9578 (65)

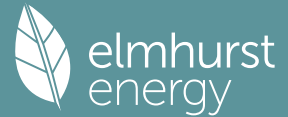
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.5899	137.9388	124.5899	128.7429	124.5899	128.7429	124.5899	124.5899	128.7429	124.5899	128.7429	124.5899 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	247.0134	249.5766	243.1174	229.3664	212.0083	195.6941	184.7952	182.2320	188.6912	202.4422	219.8003	236.1145 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088 (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)	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701 (71)
Water heating gains (Table 5)	180.3764	177.4405	171.6325	158.6957	150.8165	134.0672	128.9056	133.0327	137.8883	155.5420	167.9321	178.7067 (72)
Total internal gains	615.2060	628.1822	602.5661	580.0313	550.6410	521.7304	501.5170	503.0808	518.5487	545.8003	579.7016	602.6374 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
Northeast					17.6400	11.2829	0.5700	0.7000			0.7700	55.0335 (75)
Southeast					9.1600	36.7938	0.5700	0.7000			0.7700	93.1916 (77)
Northwest					9.1600	11.2829	0.5700	0.7000			0.7700	28.5775 (81)
Solar gains	176.8025	328.9323	523.8274	772.6939	978.3401	1020.9080	963.6052	802.5944	608.8127	383.4300	216.8263	148.0335 (83)

Full SAP Calculation Printout



Total gains 792.0086 957.1145 1126.3935 1352.7252 1528.9811 1542.6384 1465.1222 1305.6752 1127.3614 929.2303 796.5279 750.6709 (84)

7. Mean internal temperature (heating season)

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

21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	89.8035	89.9832	90.1600	91.0000	91.1589	91.9060	91.9060	92.0456	91.6168	91.1589	90.8380	90.5050
alpha	6.9869	6.9989	7.0107	7.0667	7.0773	7.1271	7.1271	7.1364	7.1078	7.0773	7.0559	7.0337
util living area	0.9967	0.9875	0.9503	0.8027	0.5800	0.3958	0.2867	0.3358	0.5807	0.9063	0.9896	0.9977 (86)
Living	20.3800	20.5286	20.7226	20.9006	20.9502	20.9560	20.9563	20.9563	20.9520	20.8472	20.5765	20.3540
Non living	19.4969	19.6445	19.8298	19.9862	20.0205	20.0304	20.0305	20.0318	20.0262	19.9513	19.6999	19.4769
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	20.6828	20.5286	20.7226	20.9006	20.9502	20.9560	20.9563	20.9563	20.9520	20.8472	20.5765	20.4443 (87)
Th 2	20.0545	20.0562	20.0579	20.0658	20.0673	20.0742	20.0742	20.0754	20.0715	20.0673	20.0643	20.0612 (88)
util rest of house	0.9953	0.9826	0.9328	0.7575	0.5241	0.3387	0.2264	0.2684	0.5053	0.8675	0.9847	0.9967 (89)
MIT 2	19.7692	19.6445	19.8298	19.9862	20.0205	20.0304	20.0305	20.0318	20.0262	19.9513	19.6999	19.5586 (90)
Living area fraction									fLA = Living area / (4) =			0.3554 (91)
MIT	20.0939	19.9586	20.1471	20.3111	20.3509	20.3593	20.3595	20.3604	20.3552	20.2697	20.0114	19.8733 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0939	19.9586	20.1471	20.3111	20.3509	20.3593	20.3595	20.3604	20.3552	20.2697	20.0114	19.8733 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9954	0.9820	0.9347	0.7700	0.5413	0.3563	0.2450	0.2891	0.5287	0.8770	0.9843	0.9964 (94)
Useful gains	788.3450	939.8964	1052.8709	1041.5461	827.5882	549.6835	358.9523	377.5299	595.9808	814.8913	784.0310	747.9998 (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	1543.3318	1468.5464	1328.2775	1100.3966	832.7710	549.9106	358.9643	377.5682	599.1397	930.8410	1247.2944	1519.6818 (97)
Space heating kWh	561.7101	355.2528	204.9025	42.3724	3.8560	0.0000	0.0000	0.0000	0.0000	86.2665	333.5497	574.1314 (98a)
Space heating requirement - total per year (kWh/year)												2162.0415
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	561.7101	355.2528	204.9025	42.3724	3.8560	0.0000	0.0000	0.0000	0.0000	86.2665	333.5497	574.1314 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2162.0415
Space heating per m2										(98c) / (4) =		22.8933 (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 %)

241.9481 (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	561.7101	355.2528	204.9025	42.3724	3.8560	0.0000	0.0000	0.0000	0.0000	86.2665	333.5497	574.1314 (98)
Space heating efficiency (main heating system 1)	241.9481	241.9481	241.9481	241.9481	241.9481	0.0000	0.0000	0.0000	0.0000	241.9481	241.9481	241.9481 (210)
Space heating fuel (main heating system)	232.1615	146.8302	84.6886	17.5130	1.5937	0.0000	0.0000	0.0000	0.0000	35.6550	137.8600	237.2953 (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 requirement	322.3989	285.2653	302.8336	265.0513	256.2559	222.4678	218.3340	227.5687	230.7421	266.8295	285.0519	318.6628 (64)
Efficiency of water heater (217)m	177.9477	177.9477	177.9477	177.9477	177.9477	177.9477	177.9477	177.9477	177.9477	177.9477	177.9477	177.9477 (216)
Fuel for water heating, kWh/month	181.1763	160.3086	170.1813	148.9490	144.0063	125.0187	122.6956	127.8852	129.6685	149.9483	160.1886	179.0767 (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	30.1696	24.2032	21.7923	15.9660	12.3326	10.0758	11.2502	14.6234	18.9944	24.9216	28.1489	31.0081 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-7.0000	-12.4482	-22.8458	-31.6397	-39.2884	-38.5710	-37.7267	-32.5872	-24.5431	-15.9765	-8.3815	-5.7098 (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												893.5974 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												177.9477
Water heating fuel used												1799.1030 (219)
Space cooling fuel												0.0000 (221)

Full SAP Calculation Printout



Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	243.4861 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-276.7179 (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	2659.4685 (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	893.5974	0.1582	141.3523 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1799.1030	0.1412	254.0625 (264)
Space and water heating			395.4148 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	243.4861	0.1443	35.1426 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-276.7179	0.1307	-36.1680
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-36.1680 (269)
Total CO2, kg/year			394.3894 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	893.5974	1.5855	1416.8124 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1799.1030	1.5222	2738.5688 (278)
Space and water heating			4155.3812 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	243.4861	1.5338	373.4671 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-276.7179	1.4828	-410.3265
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-410.3265 (283)
Total Primary energy kWh/year			4118.5218 (286)
Dwelling Primary energy Rate (DPER)			43.6100 (287)

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

1. Overall dwelling characteristics

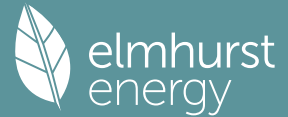
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	47.2200 (1b)	x 2.4000 (2b)	= 113.3280 (1b) - (3b)
First floor	47.2200 (1c)	x 2.4000 (2c)	= 113.3280 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.4400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 226.6560 (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) = 0.1324 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3824 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3250 (21)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Full SAP Calculation Printout



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												
	0.4144	0.4063	0.3981	0.3575	0.3494	0.3088	0.3088	0.3006	0.3250	0.3494	0.3656	0.3819 (22b)
Effective ac	0.5859	0.5825	0.5793	0.5639	0.5610	0.5477	0.5477	0.5452	0.5528	0.5610	0.5668	0.5729 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Semi-glazed door			2.1300	1.0000	2.1300		(26a)
TER Opening Type			21.5000	1.1450	24.6183		(27)
GF Ext Wall	58.0100	10.7500	47.2600	0.1800	8.5068		(29a)
1F Ext wall	58.0100	10.7500	47.2600	0.1800	8.5068		(29a)
GF Exposed Wall	25.6300	2.1300	23.5000	0.1800	4.2300		(29a)
1F Exposed Wall	25.6300		25.6300	0.1800	4.6134		(29a)
Total net area of external elements Aum(A, m2)			167.2800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		52.6053		(33)
Main dwelling							
Party Wall 1			8.2300	0.0000	0.0000		(32)

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

339.5106 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	18.1400	0.0500	0.9070
E3 Sill	17.1200	0.0500	0.8560
E4 Jamb	54.6000	0.0500	2.7300
E6 Intermediate floor within a dwelling	34.8500	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	34.8500	0.0700	2.4395
E16 Corner (normal)	9.6000	0.0900	0.8640
E18 Party wall between dwellings	9.6000	0.0600	0.5760

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

8.3725 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 60.9778 (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
	43.8200	43.5706	43.3262	42.1781	41.9633	40.9634	40.9634	40.7782	41.3486	41.9633	42.3979	42.8522 (38)
Heat transfer coeff	104.7978	104.5484	104.3040	103.1559	102.9411	101.9412	101.9412	101.7561	102.3264	102.9411	103.3757	103.8300 (39)
Average = Sum(39)m / 12 =												103.1549

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1097	1.1070	1.1044	1.0923	1.0900	1.0794	1.0794	1.0775	1.0835	1.0900	1.0946	1.0994 (40)
HLP (average)												1.0923
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

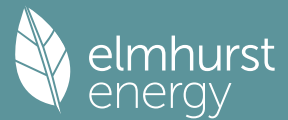
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6818 (42)
Hot water usage for mixer showers	69.1839	68.1442	66.6292	63.7304	61.5912	59.2056	57.8496	59.3531	61.0014	63.5628	66.5238	68.9189 (42a)
Hot water usage for baths	29.8746	29.4309	28.8061	27.6541	26.7915	25.8350	25.3183	25.9388	26.6143	27.6378	28.8135	29.7736 (42b)
Hot water usage for other uses	42.0938	40.5631	39.0325	37.5018	35.9711	34.4404	34.4404	35.9711	37.5018	39.0325	40.5631	42.0938 (42c)
Average daily hot water use (litres/day)												129.7508 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	141.1523	138.1383	134.4677	128.8863	124.3538	119.4810	117.6083	121.2630	125.1174	130.2330	135.9005	140.7863 (44)
Energy content (annual)	223.5508	196.7071	206.6719	176.4389	167.4041	146.9158	142.2371	150.1489	154.2823	176.7250	193.6151	220.4373 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2155.1341
	33.5326	29.5061	31.0008	26.4658	25.1106	22.0374	21.3356	22.5223	23.1423	26.5087	29.0423	33.0656 (46)
Water storage loss:												
Store volume												80.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9749 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5264 (55)
Total storage loss												
	16.3190	14.7398	16.3190	15.7926	16.3190	15.7926	16.3190	16.3190	15.7926	16.3190	15.7926	16.3190 (56)
If cylinder contains dedicated solar storage												
	16.3190	14.7398	16.3190	15.7926	16.3190	15.7926	16.3190	16.3190	15.7926	16.3190	15.7926	16.3190 (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												
	263.1322	232.4580	246.2533	214.7435	206.9855	185.2204	181.8185	189.7303	192.5869	216.3064	231.9197	260.0187 (62)
WWHRS	-31.6280	-27.9721	-29.2907	-24.2539	-22.6038	-19.3422	-18.1302	-19.2797	-20.0122	-23.5921	-26.7270	-31.0423 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h												
	231.5042	204.4859	216.9626	190.4896	184.3817	165.8782	163.6882	170.4507	172.5747	192.7143	205.1927	228.9764 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2327.2992 (64)
Electric shower(s)												2327 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month												
	105.9958	94.0059	100.3835	89.3096	87.3270	79.4932	78.9590	81.5896	81.9425	90.4262	95.0207	104.9605 (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	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876	134.0876 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	124.5643	137.9105	124.5643	128.7164	124.5643	128.7164	124.5643	124.5643	128.7164	124.5643	128.7164	124.5643 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	247.0134	249.5766	243.1174	229.3664	212.0083	195.6941	184.7952	182.2320	188.6912	202.4422	219.8003	236.1145 (68)

Full SAP Calculation Printout



Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088	36.4088 (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)	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701	-107.2701 (71)
Water heating gains (Table 5)	142.4674	139.8897	134.9241	124.0411	117.3750	110.4072	106.1276	109.6635	113.8091	121.5406	131.9732	141.0760 (72)
Total internal gains	580.2714	593.6031	568.8321	548.3502	520.1738	498.0440	478.7134	479.6860	494.4430	514.7733	546.7162	567.9811 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast	10.5400		11.2829		0.6300		0.7000		0.7700		36.3442 (75)	
Southeast	5.4800		36.7938		0.6300		0.7000		0.7700		61.6208 (77)	
Northwest	5.4800		11.2829		0.6300		0.7000		0.7700		18.8962 (81)	
Solar gains	116.8612	217.4064	346.2022	510.6524	646.5370	674.6597	636.7949	530.4046	402.3604	253.4213	143.3142	97.8466 (83)
Total gains	697.1326	811.0095	915.0343	1059.0026	1166.7109	1172.7037	1115.5083	1010.0906	896.8034	768.1946	690.0305	665.8277 (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	84.9874	85.1901	85.3898	86.3401	86.5203	87.3689	87.3689	87.5279	87.0401	86.5203	86.1566	85.7796
alpha	6.6658	6.6793	6.6927	6.7560	6.7680	6.8246	6.8246	6.8352	6.8027	6.7680	6.7438	6.7186
util living area	0.9987	0.9960	0.9860	0.9307	0.7714	0.5518	0.4016	0.4621	0.7484	0.9677	0.9963	0.9990 (86)
MIT	20.0623	20.2208	20.4567	20.7658	20.9488	20.9952	20.9995	20.9988	20.9688	20.7080	20.3317	20.0384 (87)
Th 2	19.9929	19.9951	19.9972	20.0071	20.0090	20.0177	20.0177	20.0193	20.0143	20.0090	20.0052	20.0013 (88)
util rest of house	0.9981	0.9943	0.9797	0.9027	0.7068	0.4695	0.3122	0.3644	0.6590	0.9484	0.9943	0.9986 (89)
MIT 2	18.9097	19.1136	19.4129	19.7899	19.9739	20.0157	20.0176	20.0190	19.9980	19.7342	19.2638	18.8856 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	19.3193	19.5070	19.7838	20.1367	20.3203	20.3638	20.3665	20.3672	20.3430	20.0802	19.6433	19.2953 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.3193	19.5070	19.7838	20.1367	20.3203	20.3638	20.3665	20.3672	20.3430	20.0802	19.6433	19.2953 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9976	0.9931	0.9780	0.9069	0.7281	0.4988	0.3440	0.3992	0.6904	0.9501	0.9933	0.9982 (94)
Useful gains	695.4246	805.4160	894.8649	960.3693	849.5356	584.9316	383.7893	403.2265	619.1429	729.8555	685.4095	664.6094 (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	1573.9863	1527.1405	1385.5565	1159.1287	887.3853	587.5668	383.9631	403.6859	638.8244	975.9059	1296.6721	1567.3411 (97)
Space heating kWh	653.6499	484.9989	365.0746	143.1068	28.1602	0.0000	0.0000	0.0000	0.0000	183.0615	440.1090	671.6324 (98a)
Space heating requirement - total per year (kWh/year)	2969.7933											
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	653.6499	484.9989	365.0746	143.1068	28.1602	0.0000	0.0000	0.0000	0.0000	183.0615	440.1090	671.6324 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2969.7933											
Space heating per m ²	(98c) / (4) = 31.4463 (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	653.6499	484.9989	365.0746	143.1068	28.1602	0.0000	0.0000	0.0000	0.0000	183.0615	440.1090	671.6324 (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)	708.1797	525.4592	395.5305	155.0453	30.5094	0.0000	0.0000	0.0000	0.0000	198.3332	476.8245	727.6624 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	231.5042	204.4859	216.9626	190.4896	184.3817	165.8782	163.6882	170.4507	172.5747	192.7143	205.1927	228.9764 (64)
Efficiency of water heater (217)m	86.2557	85.9259	85.2174	83.4272	80.8862	79.8000	79.8000	79.8000	79.8000	83.9447	85.7257	79.8000 (216)
Fuel for water heating, kWh/month	268.3929	237.9794	254.5990	228.3302	227.9521	207.8674	205.1231	213.5973	216.2590	229.5729	239.3597	265.2502 (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	25.8820	20.7635	18.6952	13.6969	10.5799	8.6439	9.6513	12.5452	16.2949	21.3798	24.1485	26.6013 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-31.5759	-45.6650	-67.3095	-77.6584	-85.4217	-80.3140	-79.2971	-74.0150	-65.0010	-53.0703	-35.1087	-27.1642 (233a)

Full SAP Calculation Printout



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	-14.5171	-30.8643	-61.9597	-93.9715	-125.1589	-126.1108	-124.6583	-105.1622	-76.5515	-44.4761	-19.4888	-11.4580	(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												3217.5442	(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												2794.2833	(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)												208.8826	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1555.9779	(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												4750.7321	(238)

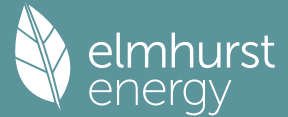
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3217.5442	0.2100	675.6843 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2794.2833	0.2100	586.7995 (264)
Space and water heating			1262.4838 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	208.8826	0.1443	30.1482 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-721.6008	0.1341	-96.7386
PV Unit electricity exported	-834.3771	0.1256	-104.8012
Total			-201.5399 (269)
Total CO2, kg/year			1103.0214 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.6800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3217.5442	1.1300	3635.8249 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2794.2833	1.1300	3157.5401 (278)
Space and water heating			6793.3650 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	208.8826	1.5338	320.3911 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-721.6008	1.4954	-1079.1091
PV Unit electricity exported	-834.3771	0.4610	-384.6807
Total			-1463.7898 (283)
Total Primary energy kWh/year			5780.0671 (286)
Target Primary Energy Rate (TPER)			61.2000 (287)

Full SAP Calculation Printout



Property Reference	Be Green ASHP				Issued on Date	24/10/2025
Assessment Reference	Flat 5		Prop Type Ref	Baseline		
Property						
SAP Rating	85 B	DER	3.85	TER	10.69	
Environmental	97 A	% DER < TER				63.99
CO ₂ Emissions (t/year)	0.27	DFEE	22.61	TFEE	29.48	
Compliance Check	See BREL	% DFEE < TFEE				23.29
% DPER < TPER	27.69	DPER	40.45	TPER	55.95	
Assessor Details	Mr. Neil Bradford				Assessor ID	T704-0001
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)
Main dwelling			
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.5000		
Dwelling volume			

2. Ventilation rate

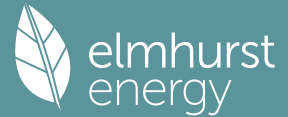
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1089 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3589 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3051 (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	0.3890	0.3814	0.3737	0.3356	0.3280	0.2898	0.2898	0.2822	0.3051	0.3280	0.3432	0.3585 (22b)
Effective ac	0.5757	0.5727	0.5698	0.5563	0.5538	0.5420	0.5420	0.5398	0.5465	0.5538	0.5589	0.5643 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			22.0500	0.9615	21.2019		(27)
Solid door			2.1300	1.0000	2.1300		(26a)
Heatloss Floor 1			67.7500	0.0900	6.0975	110.0000	7452.5000 (28a)
External Wall 1	50.9000	22.0500	28.8500	0.1300	3.7505	190.0000	5481.5003 (29a)
Corridor Wall	17.4000	2.1300	15.2700	0.1200	1.8324	190.0000	2901.2999 (29a)
Total net area of external elements Aum(A, m ²)			136.0500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 35.0123		(33)
Main dwelling							
Party Wall 1			24.2600	0.0000	0.0000	180.0000	4366.8000 (32)
Party Floor 1			76.5000			40.0000	3060.0000 (32d)
Party Ceiling 1			76.5000			30.0000	2295.0000 (32b)
Internal Wall 1			101.0400			9.0000	909.3600 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	26466.4603 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							345.9668 (35)
List of Thermal Bridges							
K1 Element					Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate					11.5100	0.0410	0.4719
E3 Sill					10.5000	0.0060	0.0630
E4 Jamb					25.2000	0.0100	0.2520

Full SAP Calculation Printout



E7 Party floor between dwellings (in blocks of flats)	32.3000	0.0000	0.0000	
E16 Corner (normal)	4.8000	0.0340	0.1632	
E18 Party wall between dwellings	4.8000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				0.9501 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		35.9624 (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	34.8780	34.7000	34.5255	33.7060	33.5526	32.8389	32.8389	32.7067	33.1138	33.5526	33.8628	34.1871
Heat transfer coeff	70.8404	70.6624	70.4879	69.6684	69.5151	68.8013	68.8013	68.6691	69.0762	69.5151	69.8253	70.1495
Average = Sum(39)m / 12 =												69.6677
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9260	0.9237	0.9214	0.9107	0.9087	0.8994	0.8994	0.8976	0.9030	0.9087	0.9127	0.9170
HLP (average)												0.9107
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3931 (42)
Hot water usage for mixer showers	88.4731	87.1435	85.2061	81.4991	78.7634	75.7127	73.9786	75.9014	78.0091	81.2847	85.0713	88.1341	(42a)
Hot water usage for baths	27.7933	27.3805	26.7992	25.7275	24.9250	24.0351	23.5545	24.1317	24.7601	25.7123	26.8061	27.6993	(42b)
Hot water usage for other uses	39.1377	37.7145	36.2913	34.8682	33.4450	32.0218	32.0218	33.4450	34.8682	36.2913	37.7145	39.1377	(42c)
Average daily hot water use (litres/day)													142.9177 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	155.4041	152.2386	148.2967	142.0947	137.1334	131.7696	129.5548	133.4780	137.6374	143.2884	149.5920	154.9712	(44)
Energy conte	246.1221	216.7857	227.9264	194.5206	184.6079	162.0261	156.6854	165.2737	169.7207	194.4410	213.1212	242.6474	(45)
Energy content (annual)													Total = Sum(45)m = 2373.8782
Distribution loss (46)m = 0.15 x (45)m	36.9183	32.5179	34.1890	29.1781	27.6912	24.3039	23.5028	24.7911	25.4581	29.1662	31.9682	36.3971	(46)
Water storage loss:													80.0000 (47)
Store volume													1.4300 (48)
a) If manufacturer declared loss factor is known (kWh/day):													0.6000 (49)
Temperature factor from Table 2b													0.8580 (55)
Enter (49) or (54) in (55)													
Total storage loss	26.5980	24.0240	26.5980	25.7400	26.5980	25.7400	26.5980	26.5980	25.7400	26.5980	25.7400	26.5980	(56)
If cylinder contains dedicated solar storage	26.5980	24.0240	26.5980	25.7400	26.5980	25.7400	26.5980	26.5980	25.7400	26.5980	25.7400	26.5980	(57)
Primary loss	31.1612	28.1456	31.1612	30.1560	31.1612	22.5120	23.2624	23.2624	22.5120	31.1612	30.1560	31.1612	(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	303.8813	268.9553	285.6856	250.4166	242.3671	210.2781	206.5458	215.1341	217.9727	252.2002	269.0172	300.4066	(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	303.8813	268.9553	285.6856	250.4166	242.3671	210.2781	206.5458	215.1341	217.9727	252.2002	269.0172	300.4066	(64)
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 3022.8606 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
													0.0000 (64a)
Heat gains from water heating, kWh/month	128.0430	113.8169	121.9929	109.3949	107.5895	92.4753	91.9862	94.8418	95.0337	110.8590	115.5796	126.8876	(65)

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

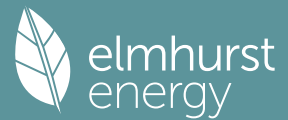
Metabolic gains (Table 5), Watts													
(66)m	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.9148	118.3699	106.9148	110.4786	106.9148	110.4786	106.9148	106.9148	110.4786	106.9148	110.4786	106.9148	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	211.9705	214.1701	208.6272	196.8270	181.9314	167.9317	158.5790	156.3794	161.9223	173.7225	188.6181	202.6178	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	(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)	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	(71)
Water heating gains (Table 5)	172.1008	169.3704	163.9690	151.9374	144.6095	128.4379	123.6374	127.4756	131.9913	149.0040	160.5272	170.5479	(72)
Total internal gains	549.8825	560.8070	538.4074	518.1395	492.3522	465.7446	448.0276	449.6662	463.2887	488.5377	518.5204	538.9770	(73)

6. Solar gains

[Jan]													
			Area		Solar flux		g		FF		Access		Gains
			m2		Table 6a		W/m2		Specific data		factor		W
									Specific data		Table 6d		
Northeast			4.4100		11.2829		0.5700		0.7700		0.7700		13.7584 (75)
Southeast			8.8200		36.7938		0.5700		0.7700		0.7700		89.7325 (77)
Southwest			8.8200		36.7938		0.5700		0.7700		0.7700		89.7325 (79)
Solar gains	193.2234	333.7008	468.7227	601.1164	691.8716	695.0372	666.6906	597.7342	514.3760	372.0834	232.2693	164.8204	(83)
Total gains	743.1059	894.5078	1007.1302	1119.2559	1184.2239	1160.7818	1114.7182	1047.4005	977.6647	860.6212	750.7897	703.7974	(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	103.7797	104.0411	104.2987	105.5255	105.7583	106.8554	106.8554	107.0611	106.4301	105.7583	105.2885	104.8018	
alpha	7.9186	7.9361	7.9532	8.0350	8.0506	8.1237	8.1237	8.1374	8.0953	8.0506	8.0192	7.9868	
util living area	0.9905	0.9641	0.8947	0.7325	0.5440	0.3792	0.2716	0.3016	0.4868	0.7984	0.9679	0.9934 (86)	
Living	20.5886	20.7316	20.8601	20.9420	20.9594	20.9616	20.9617	20.9617	20.9609	20.9314	20.7578	20.5615	
Non living	19.7822	19.9203	20.0361	20.1080	20.1206	20.1297	20.1297	20.1312	20.1263	20.1040	19.9555	19.7625	
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	20.7896	20.7316	20.8601	20.9420	20.9594	20.9616	20.9617	20.9617	20.9609	20.9314	20.7578	20.6228 (87)	
Th 2	20.1454	20.1474	20.1493	20.1584	20.1601	20.1680	20.1680	20.1695	20.1650	20.1601	20.1567	20.1531 (88)	
util rest of house	0.9868	0.9521	0.8670	0.6882	0.4957	0.3300	0.2202	0.2471	0.4283	0.7479	0.9550	0.9907 (89)	
MIT 2	19.9596	19.9203	20.0361	20.1080	20.1206	20.1297	20.1297	20.1312	20.1263	20.1040	19.9555	19.8172 (90)	
Living area fraction									fLA = Living area / (4) =				0.3744 (91)
MIT	20.2703	20.2240	20.3446	20.4202	20.4346	20.4411	20.4412	20.4422	20.4388	20.4138	20.2559	20.1188 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.2703	20.2240	20.3446	20.4202	20.4346	20.4411	20.4412	20.4422	20.4388	20.4138	20.2559	20.1188 (93)	

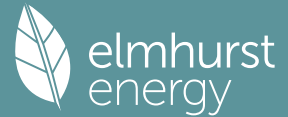
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9874	0.9534	0.8738	0.7023	0.5116	0.3462	0.2371	0.2650	0.4475	0.7638	0.9568	0.9906 (94)
Useful gains	733.7432	852.7900	880.0359	786.0852	605.8186	401.8303	264.2767	277.5677	437.4965	657.3838	718.3222	697.1750 (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	1131.3442	1082.8305	975.8763	802.5935	607.1881	401.8778	264.2784	277.5718	437.8593	682.2056	918.6127	1116.6964 (97)
Space heating kWh	295.8151	154.5872	71.3052	11.8860	1.0189	0.0000	0.0000	0.0000	0.0000	18.4674	144.2091	312.1239 (98a)
Space heating requirement - total per year (kWh/year)												1009.4129
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	295.8151	154.5872	71.3052	11.8860	1.0189	0.0000	0.0000	0.0000	0.0000	18.4674	144.2091	312.1239 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1009.4129
Space heating per m2										(98c) / (4) =		13.1949 (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 %)													231.1896 (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	295.8151	154.5872	71.3052	11.8860	1.0189	0.0000	0.0000	0.0000	0.0000	18.4674	144.2091	312.1239 (98)	
Space heating efficiency (main heating system 1)	231.1896	231.1896	231.1896	231.1896	231.1896	0.0000	0.0000	0.0000	0.0000	231.1896	231.1896	231.1896 (210)	
Space heating fuel (main heating system)	127.9535	66.8660	30.8428	5.1412	0.4407	0.0000	0.0000	0.0000	0.0000	7.9880	62.3770	135.0078 (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	303.8813	268.9553	285.6856	250.4166	242.3671	210.2781	206.5458	215.1341	217.9727	252.2002	269.0172	300.4066 (64)	
Efficiency of water heater	181.7218	181.7218	181.7218	181.7218	181.7218	181.7218	181.7218	181.7218	181.7218	181.7218	181.7218	181.7218 (216)	
Fuel for water heating, kWh/month	167.2233	148.0038	157.2104	137.8022	133.3726	115.7142	113.6604	118.3865	119.9485	138.7837	148.0379	165.3112 (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	21.7607	17.4573	15.7183	11.5159	8.8952	7.2675	8.1145	10.5476	13.7002	17.9755	20.3032	22.3655 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-6.9027	-12.1836	-22.2439	-30.8447	-38.3089	-37.5649	-36.7461	-31.8157	-24.0495	-15.6441	-8.2374	-5.6391 (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													436.6170 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													181.7218
Water heating fuel used													1663.4548 (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)													175.6215 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													

Full SAP Calculation Printout



PV generation	-270.1805	(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	2005.5128	(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	436.6170	0.1594	69.5789 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	1663.4548	0.1412	234.8712 (264)
Space and water heating			304.4500 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	175.6215	0.1443	25.3476 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-270.1805	0.1307	-35.3200
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-35.3200 (269)
Total CO ₂ , kg/year			294.4776 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8500 (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	436.6170	1.5898	694.1318 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1663.4548	1.5221	2531.9540 (278)
Space and water heating			3226.0857 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	175.6215	1.5338	269.3741 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-270.1805	1.4829	-400.6567
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-400.6567 (283)
Total Primary energy kWh/year			3094.8032 (286)
Dwelling Primary energy Rate (DPER)			40.4500 (287)

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

1. Overall dwelling characteristics

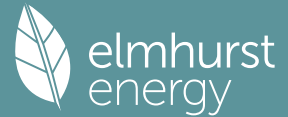
	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	76.5000 (1b)	x 2.4000 (2b)	= 183.6000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.6000 (5)

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	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) = 0.1634 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4134 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3514 (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	0.4480	0.4392	0.4305	0.3865	0.3777	0.3338	0.3338	0.3250	0.3514	0.3777	0.3953	0.4129 (22b)
Effective ac	0.6004	0.5965	0.5926	0.5747	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

Full SAP Calculation Printout



3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			2.1300	1.0000	2.1300			(26a)
TER Opening Type			17.0000	1.1450	19.4656			(27)
Heatloss Floor 1			67.7500	0.1300	8.8075			(28a)
External Wall 1	50.9000	17.0000	33.9000	0.1800	6.1020			(29a)
Corridor Wall	17.4000	2.1300	15.2700	0.1800	2.7486			(29a)
Total net area of external elements Aum(A, m2)			136.0500					(31)
Fabric heat loss, W/K = Sum (A x U)					39.2537			(33)
Main dwelling								
Party Wall 1			24.2600	0.0000	0.0000			(32)

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

355.9668 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	11.5100	0.0500	0.5755	
E1 Steel lintel with perforated steel base plate	10.5000	0.0500	0.5250	
E3 Sill	25.2000	0.0500	1.2600	
E4 Jamb	32.3000	0.0700	2.2610	
E7 Party floor between dwellings (in blocks of flats)	4.8000	0.0900	0.4320	
E16 Corner (normal)	4.8000	0.0600	0.2880	
E18 Party wall between dwellings				5.3415 (36)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				0.0000
Point Thermal bridges				(36a) =
Total fabric heat loss				(33) + (36) + (36a) = 44.5952 (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	36.3747	36.1386	35.9071	34.8200	34.6166	33.6698	33.6698	33.4945	34.0345	34.6166	35.0281	35.4583	(38)
Heat transfer coeff	80.9699	80.7338	80.5024	79.4153	79.2119	78.2651	78.2651	78.0897	78.6298	79.2119	79.6234	80.0535	(39)
Average = Sum(39)m / 12 =												79.4143	
HLP	1.0584	1.0553	1.0523	1.0381	1.0354	1.0231	1.0231	1.0208	1.0278	1.0354	1.0408	1.0465	(40)
HLP (average)												1.0381	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

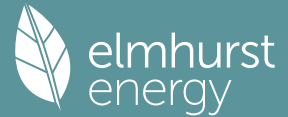
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3931 (42)
Hot water usage for mixer showers	64.3441	63.3771	61.9681	59.2721	57.2825	55.0638	53.8026	55.2010	56.7339	59.1162	61.8701	64.0976	(42a)
Hot water usage for baths	27.7933	27.3805	26.7992	25.7275	24.9250	24.0351	23.5545	24.1317	24.7601	25.7123	26.8061	27.6993	(42b)
Hot water usage for other uses	39.1377	37.7145	36.2913	34.8682	33.4450	32.0218	32.0218	33.4450	34.8682	36.2913	37.7145	39.1377	(42c)
Average daily hot water use (litres/day)												120.6716	(43)
Daily hot water use	131.2751	128.4722	125.0586	119.8677	115.6525	111.1207	109.3789	112.7776	116.3622	121.1198	126.3907	130.9346	(44)
Energy conte	207.9076	182.9426	192.2105	164.0929	155.6904	136.6358	132.2843	139.6423	143.4862	164.3585	180.0668	205.0119	(45)
Energy content (annual)										Total = Sum(45)m =		2004.3299	
Distribution loss (46)m = 0.15 x (45)m	31.1861	27.4414	28.8316	24.6139	23.3536	20.4954	19.8426	20.9463	21.5229	24.6538	27.0100	30.7518	(46)
Water storage loss:													
Store volume												80.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9749	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.5264	(55)
Total storage loss	16.3190	14.7398	16.3190	15.7926	16.3190	15.7926	16.3190	16.3190	15.7926	16.3190	15.7926	16.3190	(56)
If cylinder contains dedicated solar storage	16.3190	14.7398	16.3190	15.7926	16.3190	15.7926	16.3190	16.3190	15.7926	16.3190	15.7926	16.3190	(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	247.4891	218.6936	231.7919	202.3975	195.2718	174.9404	171.8657	179.2237	181.7908	203.9399	218.3714	244.5933	(62)
WWHRS	-29.4154	-26.0152	-27.2417	-22.5572	-21.0225	-17.9891	-16.8619	-17.9309	-18.6122	-21.9417	-24.8573	-28.8707	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	218.0736	192.6784	204.5502	179.8403	174.2494	156.9513	155.0038	161.2928	163.1786	181.9982	193.5140	215.7226	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2197.0533	(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	100.7944	89.4292	95.5751	85.2046	83.4322	76.0751	75.6496	78.0962	78.3528	86.3143	90.5159	99.8316	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	119.6549	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.9223	118.3782	106.9223	110.4863	106.9223	110.4863	106.9223	106.9223	110.4863	106.9223	110.4863	106.9223	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	211.9705	214.1701	208.6272	196.8270	181.9314	167.9317	158.5790	156.3794	161.9223	173.7225	188.6181	202.6178	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	34.9655	(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)	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	-95.7239	(71)
Water heating gains (Table 5)	135.4764	133.0792	128.4612	118.3397	112.1401	105.6598	101.6796	104.9680	108.8234	116.0139	125.7165	134.1823	(72)
Total internal gains	516.2656	527.5240	505.9071	487.5495	462.8902	442.9743	426.0773	427.1661	440.1285	458.5551	486.7174	505.6188	(73)

Full SAP Calculation Printout



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
Northeast	3.4000				11.2829	0.6300		0.7000		0.7700	11.7239 (75)
Southeast	6.8000				36.7938	0.6300		0.7000		0.7700	76.4638 (77)
Southwest	6.8000				36.7938	0.6300		0.7000		0.7700	76.4638 (79)
Solar gains	164.6515	284.3566	399.4128	512.2296	589.5648	592.2623	568.1072	509.3475	438.3154	317.0636	140.4485 (83)
Total gains	680.9171	811.8806	905.3200	999.7791	1052.4550	1035.2366	994.1846	936.5136	878.4439	775.6186	646.0673 (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	93.4210	93.6942	93.9636	95.2499	95.4944	96.6497	96.6497	96.8667	96.2014	95.4944	95.0010	94.4905
alpha	7.2281	7.2463	7.2642	7.3500	7.3663	7.4433	7.4433	7.4578	7.4134	7.3663	7.3334	7.2994
util living area	0.9965	0.9873	0.9596	0.8621	0.6840	0.4827	0.3463	0.3834	0.6109	0.9053	0.9885	0.9975 (86)
MIT	20.2840	20.4702	20.6825	20.8944	20.9821	20.9988	20.9999	20.9998	20.9937	20.8703	20.5419	20.2543 (87)
Th 2	20.0349	20.0375	20.0400	20.0517	20.0539	20.0642	20.0642	20.0661	20.0602	20.0539	20.0494	20.0448 (88)
util rest of house	0.9949	0.9821	0.9439	0.8206	0.6209	0.4128	0.2727	0.3057	0.5311	0.8645	0.9827	0.9964 (89)
MIT 2	19.2213	19.4579	19.7186	19.9626	20.0426	20.0637	20.0641	20.0660	20.0573	19.9467	19.5597	19.1914 (90)
Living area fraction	19.6191	19.8369	20.0794	20.3115	20.3943	20.4137	20.4145	20.4156	20.4079	20.2924	19.9274	19.5894 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6191	19.8369	20.0794	20.3115	20.3943	20.4137	20.4145	20.4156	20.4079	20.2924	19.9274	19.5894 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9940	0.9807	0.9447	0.8328	0.6441	0.4390	0.3003	0.3348	0.5610	0.8759	0.9818	0.9957 (94)
Useful gains	676.8639	796.1920	855.2323	832.6477	677.9157	454.4516	298.5127	313.5181	492.8429	679.3951	672.1844	643.2916 (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	1240.3901	1205.9116	1093.1770	906.2443	688.6958	455.0134	298.5397	313.5778	495.9875	767.7570	1021.3596	1231.9720 (97)
Space heating kWh	419.2635	275.3315	177.0308	52.9896	8.0205	0.0000	0.0000	0.0000	0.0000	65.7413	251.4061	437.9782 (98a)
Space heating requirement - total per year (kWh/year)												1687.7615
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	419.2635	275.3315	177.0308	52.9896	8.0205	0.0000	0.0000	0.0000	0.0000	65.7413	251.4061	437.9782 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1687.7615
Space heating per m ²										(98c) / (4) =		22.0622 (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	419.2635	275.3315	177.0308	52.9896	8.0205	0.0000	0.0000	0.0000	0.0000	65.7413	251.4061	437.9782	(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)	454.2400	298.3007	191.7994	57.4101	8.6895	0.0000	0.0000	0.0000	0.0000	71.2256	272.3793	474.5159	(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	218.0736	192.6784	204.5502	179.8403	174.2494	156.9513	155.0038	161.2928	163.1786	181.9982	193.5140	215.7226	(64)
Efficiency of water heater	85.5005	84.8598	83.7374	81.6842	80.1575	79.8000	79.8000	79.8000	79.8000	82.0055	84.6477	79.8000	(216)
(217)m	85.5005	84.8598	83.7374	81.6842	80.1575	79.8000	79.8000	79.8000	79.8000	82.0055	84.6477	85.6136	(217)
Fuel for water heating, kWh/month	255.0553	227.0549	244.2758	220.1655	217.3838	196.6809	194.2403	202.1213	204.4845	221.9340	228.6110	251.9724	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.2163	17.8228	16.0474	11.7570	9.0815	7.4196	8.2844	10.7684	13.9871	18.3518	20.7283	22.8338	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-25.9106	-37.6493	-55.7603	-64.6630	-71.4281	-67.2862	-66.4555	-61.8937	-54.1360	-43.9202	-28.8789	-22.2719	(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	-11.4264	-24.3424	-48.9526	-74.3637	-99.1502	-99.9258	-98.7562	-83.2467	-60.5269	-35.0961	-15.3472	-9.0136	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

Full SAP Calculation Printout



(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												1828.5607	(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												2663.9795	(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)												179.2985	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1260.4014	(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												3497.4374	(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	1828.5607	0.2100	383.9977	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2663.9795	0.2100	559.4357	(264)
Space and water heating			943.4334	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	179.2985	0.1443	25.8783	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-600.2537	0.1340	-80.4057	
PV Unit electricity exported	-660.1476	0.1256	-82.8896	
Total			-163.2953	(269)
Total CO2, kg/year			817.9457	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6900	(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	1828.5607	1.1300	2066.2735	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2663.9795	1.1300	3010.2969	(278)
Space and water heating			5076.5704	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	179.2985	1.5338	275.0141	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-600.2537	1.4950	-897.3983	
PV Unit electricity exported	-660.1476	0.4609	-304.2512	
Total			-1201.6495	(283)
Total Primary energy kWh/year			4280.0358	(286)
Target Primary Energy Rate (TPER)			55.9500	(287)

Full SAP Calculation Printout



Property Reference	Be Green ASHP			Issued on Date	24/10/2025
Assessment Reference	Flat 6	Prop Type Ref	Baseline		
Property					
SAP Rating	88 B	DER	3.26	TER	10.92
Environmental	97 A	% DER < TER			70.15
CO ₂ Emissions (t/year)	0.19	DFEE	19.98	TFEE	27.04
Compliance Check	See BREL	% DFEE < TFEE			26.10
% DPER < TPER	40.29	DPER	34.19	TPER	57.27
Assessor Details	Mr. Neil Bradford			Assessor ID	T704-0001
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)
Main dwelling			
Ground floor	66.9000 (1b)	2.4000 (2b)	160.5600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9000		160.5600 (4)
Dwelling volume			160.5600 (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) = 0.1246 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3746 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3184 (21)

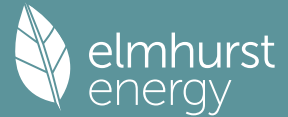
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4059	0.3980	0.3900	0.3502	0.3423	0.3025	0.3025	0.2945	0.3184	0.3423	0.3582	0.3741 (22b)
Effective ac	0.5824	0.5792	0.5761	0.5613	0.5586	0.5457	0.5457	0.5434	0.5507	0.5586	0.5641	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			17.4300	0.9615	16.7596		(27)
Solid door			2.1300	1.0000	2.1300		(26a)
External Wall 1	49.4600	17.4300	32.0300	0.1300	4.1639	190.0000	6085.6998 (29a)
Corridor Wall	14.8200	2.1300	12.6900	0.1200	1.5228	190.0000	2411.0999 (29a)
Total net area of external elements Aum(A, m ²)			64.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.5763		(33)
Main dwelling							
Party Wall 1			21.1100	0.0000	0.0000	180.0000	3799.8001 (32)
Party Floor 1			66.9000			40.0000	2676.0000 (32d)
Party Ceiling 1			66.9000			30.0000	2007.0000 (32b)
Internal Wall 1			77.6900			9.0000	699.2100 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17678.8099 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							264.2572 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				10.1100	0.0410	0.4145	
E3 Sill				9.1000	0.0060	0.0546	
E4 Jamb				23.1000	0.0100	0.2310	
E7 Party floor between dwellings (in blocks of flats)				31.4500	0.0000	0.0000	

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	87.2291	87.4925	87.7523	88.9934	89.2296	90.3454	90.3454	90.5551	89.9123	89.2296	88.7532	88.2606
alpha	6.8153	6.8328	6.8502	6.9329	6.9486	7.0230	7.0230	7.0370	6.9942	6.9486	6.9169	6.8840
util living area												
	0.9768	0.9303	0.8202	0.6113	0.4238	0.2873	0.2074	0.2407	0.4152	0.7289	0.9378	0.9826 (86)
Living	20.5637	20.7278	20.8707	20.9436	20.9543	20.9557	20.9557	20.9558	20.9550	20.9273	20.7513	20.5340
Non living	19.8299	19.9861	20.1131	20.1795	20.1885	20.1982	20.1982	20.2000	20.1944	20.1713	20.0199	19.8088
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	20.7768	20.7278	20.8707	20.9436	20.9543	20.9557	20.9557	20.9558	20.9550	20.9273	20.7513	20.5992 (87)
Th 2	20.2175	20.2197	20.2218	20.2319	20.2337	20.2425	20.2425	20.2441	20.2391	20.2337	20.2299	20.2260 (88)
util rest of house												
	0.9705	0.9147	0.7908	0.5750	0.3892	0.2534	0.1717	0.2011	0.3697	0.6841	0.9209	0.9777 (89)
MIT 2	20.0192	19.9861	20.1131	20.1795	20.1885	20.1982	20.1982	20.2000	20.1944	20.1713	20.0199	19.8672 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.3779	20.3372	20.4718	20.5413	20.5510	20.5568	20.5568	20.5578	20.5545	20.5292	20.3661	20.2137 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3779	20.3372	20.4718	20.5413	20.5510	20.5568	20.5568	20.5578	20.5545	20.5292	20.3661	20.2137 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9719	0.9172	0.8006	0.5897	0.4035	0.2675	0.1865	0.2175	0.3886	0.7018	0.9242	0.9776 (94)
Useful gains	615.6045	707.1066	724.7322	635.0458	486.5855	323.7630	215.0746	225.4709	352.2348	529.0308	593.1141	586.0919 (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	905.1434	866.4588	781.8861	642.3808	487.1200	323.7855	215.0759	225.4748	352.5264	546.4571	734.0251	890.9959 (97)
Space heating kWh	215.4169	107.0847	42.5225	5.2812	0.3976	0.0000	0.0000	0.0000	0.0000	12.9651	101.4559	226.8486 (98a)
Space heating requirement - total per year (kWh/year)												711.9726
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	215.4169	107.0847	42.5225	5.2812	0.3976	0.0000	0.0000	0.0000	0.0000	12.9651	101.4559	226.8486 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												711.9726
Space heating per m2										(98c) / (4) =		10.6423 (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 %)												220.9702 (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	215.4169	107.0847	42.5225	5.2812	0.3976	0.0000	0.0000	0.0000	0.0000	12.9651	101.4559	226.8486 (98)
Space heating efficiency (main heating system 1)	220.9702	220.9702	220.9702	220.9702	220.9702	0.0000	0.0000	0.0000	0.0000	220.9702	220.9702	220.9702 (210)
Space heating fuel (main heating system)	97.4869	48.4612	19.2435	2.3900	0.1799	0.0000	0.0000	0.0000	0.0000	5.8674	45.9138	102.6603 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	226.6952	200.6791	213.7477	189.3126	184.4402	159.5666	157.8855	163.9118	165.4318	191.7762	202.4222	224.4059 (64)
Efficiency of water heater (217)m	182.3869	182.3869	182.3869	182.3869	182.3869	182.3869	182.3869	182.3869	182.3869	182.3869	182.3869	182.3869 (216)
Fuel for water heating, kWh/month	124.2936	110.0293	117.1946	103.7972	101.1258	87.4880	86.5662	89.8704	90.7037	105.1480	110.9850	123.0384 (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	21.1546	16.9710	15.2805	11.1952	8.6475	7.0651	7.8885	10.2538	13.3186	17.4748	19.7377	21.7426 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-6.8225	-11.9694	-21.6974	-29.9210	-37.0067	-36.2111	-35.4520	-30.7894	-23.3992	-15.3354	-8.1221	-5.5793 (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												322.2030 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												182.3869
Water heating fuel used												1250.2404 (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)												170.7298 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-262.3053 (233)

Full SAP Calculation Printout



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	1480.8678 (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	322.2030	0.1596	51.4185 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1250.2404	0.1410	176.3398 (264)
Space and water heating			227.7583 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	170.7298	0.1443	24.6416 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-262.3053	0.1308	-34.3155
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-34.3155 (269)
Total CO2, kg/year			218.0844 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.2600 (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	322.2030	1.5906	512.4961 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1250.2404	1.5215	1902.2961 (278)
Space and water heating			2414.7922 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	170.7298	1.5338	261.8710 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-262.3053	1.4833	-389.0725
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-389.0725 (283)
Total Primary energy kWh/year			2287.5907 (286)
Dwelling Primary energy Rate (DPER)			34.1900 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	66.9000 (1b)	x 2.4000 (2b)	= 160.5600 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	160.5600 (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) =	0.1246 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3746	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3184 (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	1.1750	1.1750 (22a)
Adj infilt rate	0.4059	0.3980	0.3900	0.3502	0.3423	0.3025	0.3025	0.2945	0.3184	0.3423	0.3582	0.3741 (22b)
Effective ac	0.5824	0.5792	0.5761	0.5613	0.5586	0.5457	0.5457	0.5434	0.5507	0.5586	0.5641	0.5700 (25)

Full SAP Calculation Printout



3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			2.1300	1.0000	2.1300			(26a)
TER Opening Type			14.6000	1.1450	16.7176			(27)
External Wall 1	49.4600	14.6000	34.8600	0.1800	6.2748			(29a)
Corridor Wall	14.8200	2.1300	12.6900	0.1800	2.2842			(29a)
Total net area of external elements Aum(A, m2)			64.2800					(31)
Fabric heat loss, W/K = Sum (A x U)								(33)
Main dwelling								
Party Wall 1			21.1100	0.0000	0.0000			(32)

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

274.2572 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	10.1100	0.0500	0.5055
E3 Sill	9.1000	0.0500	0.4550
E4 Jamb	23.1000	0.0500	1.1550
E7 Party floor between dwellings (in blocks of flats)	31.4500	0.0700	2.2015
E16 Corner (normal)	4.8000	0.0900	0.4320
E18 Party wall between dwellings	4.8000	0.0600	0.2880

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

Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	32.4436 (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	30.8579	30.6884	30.5222	29.7418	29.5957	28.9160	28.9160	28.7901	29.1778	29.5957	29.8911	30.2000
Heat transfer coeff	63.3014	63.1319	62.9658	62.1853	62.0393	61.3595	61.3595	61.2337	61.6214	62.0393	62.3347	62.6435
Average = Sum(39)m / 12 =												62.1846

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9462	0.9437	0.9412	0.9295	0.9273	0.9172	0.9172	0.9153	0.9211	0.9273	0.9318	0.9364
HLP (average)												0.9295
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.1686 (42)
Hot water usage for mixer showers													
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	(42a)
Hot water usage for baths	69.8296	68.7925	67.3321	64.6394	62.6231	60.3874	59.1797	60.6299	62.2089	64.6012	67.3494	69.5935	(42b)
Hot water usage for other uses	36.8384	35.4988	34.1592	32.8197	31.4801	30.1405	30.1405	31.4801	32.8197	34.1592	35.4988	36.8384	(42c)
Average daily hot water use (litres/day)													98.2325 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	106.6680	104.2914	101.4914	97.4591	94.1032	90.5279	89.3202	92.1100	95.0286	98.7605	102.8482	106.4319
Energy conte	168.9360	148.5095	155.9885	133.4166	126.6810	111.3146	108.0251	114.0514	117.1798	134.0170	146.5262	166.6467
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m	25.3404	22.2764	23.3983	20.0125	19.0021	16.6972	16.2038	17.1077	17.5770	20.1026	21.9789	24.9970

Water storage loss:

Store volume 80.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 0.9749 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.5264 (55)

Total storage loss

16.3190 14.7398 16.3190 15.7926 16.3190 15.7926 16.3190 16.3190 15.7926 16.3190 15.7926 16.3190 16.3190 (56)

If cylinder contains dedicated solar storage

16.3190 14.7398 16.3190 15.7926 16.3190 15.7926 16.3190 16.3190 15.7926 16.3190 15.7926 16.3190 16.3190 (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 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 0.0000 (61)

Total heat required for water heating calculated for each month

208.5175 184.2605 195.5699 171.7212 166.2624 149.6192 147.6065 153.6329 155.4843 173.5985 184.8308 206.2281 (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

208.5175 184.2605 195.5699 171.7212 166.2624 149.6192 147.6065 153.6329 155.4843 173.5985 184.8308 206.2281 (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

87.8364 77.9802 83.5313 75.0047 73.7866 67.6558 67.5835 69.5872 69.6059 76.2258 79.3636 87.0752 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289	108.4289

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

95.8715 106.1435 95.8715 99.0673 95.8715 99.0673 95.8715 95.8715 99.0673 95.8715 99.0673 95.8715 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

189.9565 191.9277 186.9604 176.3858 163.0371 150.4913 142.1099 140.1388 145.1060 155.6807 169.0293 181.5751 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

33.8429 33.8429 33.8429 33.8429 33.8429 33.8429 33.8429 33.8429 33.8429 33.8429 33.8429 33.8429 (69)

Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 (70)

Losses e.g. evaporation (negative values) (Table 5)

-86.7431 -86.7431 -86.7431 -86.7431 -86.7431 -86.7431 -86.7431 -86.7431 -86.7431 -86.7431 -86.7431 -86.7431 (71)

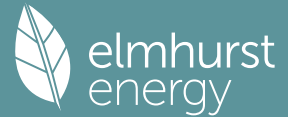
Water heating gains (Table 5)

118.0596 116.0419 112.2732 104.1732 99.1755 93.9664 90.8380 93.5312 96.6749 102.4540 110.2273 117.0365 (72)

Total internal gains

462.4164 472.6418 453.6339 438.1549 416.6128 399.0536 384.3481 385.0702 396.3769 412.5349 436.8525 453.0119 (73)

Full SAP Calculation Printout



6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W
Northeast					2.1100	11.2829	0.6300	0.7000	0.7700			7.2757 (75)
Southwest					5.1000	36.7938	0.6300	0.7000	0.7700			57.3478 (79)
Northwest					7.3900	11.2829	0.6300	0.7000	0.7700			25.4823 (81)
Solar gains	90.1059	164.3645	253.7923	362.9045	450.7002	466.8906	442.0383	373.5652	291.1091	189.4504	109.9076	75.8297 (83)
Total gains	552.5222	637.0063	707.4262	801.0593	867.3130	865.9441	826.3864	758.6354	687.4860	601.9853	546.7601	528.8415 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.5134	80.7296	80.9426	81.9585	82.1514	83.0615	83.0615	83.2322	82.7085	82.1514	81.7621	81.3590
alpha	6.3676	6.3820	6.3962	6.4639	6.4768	6.5374	6.5374	6.5488	6.5139	6.4768	6.4508	6.4239
util living area	0.9923	0.9805	0.9481	0.8374	0.6485	0.4521	0.3266	0.3709	0.6079	0.8943	0.9804	0.9940 (86)
MIT	20.2156	20.3957	20.6262	20.8738	20.9776	20.9981	20.9998	20.9996	20.9887	20.8348	20.4895	20.1867 (87)
Th 2	20.1284	20.1305	20.1326	20.1425	20.1443	20.1529	20.1529	20.1545	20.1496	20.1443	20.1406	20.1367 (88)
util rest of house	0.9897	0.9744	0.9329	0.8005	0.5947	0.3929	0.2638	0.3030	0.5376	0.8590	0.9733	0.9920 (89)
MIT 2	19.2283	19.4561	19.7399	20.0277	20.1282	20.1520	20.1529	20.1544	20.1432	19.9954	19.5839	19.1981 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.6957	19.9009	20.1594	20.4283	20.5303	20.5525	20.5538	20.5545	20.5435	20.3928	20.0126	19.6661 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.6957	19.9009	20.1594	20.4283	20.5303	20.5525	20.5538	20.5545	20.5435	20.3928	20.0126	19.6661 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9881	0.9725	0.9334	0.8135	0.6194	0.4209	0.2935	0.3352	0.5706	0.8702	0.9720	0.9906 (94)
Useful gains	545.9726	619.4694	660.3467	651.6458	537.1901	364.4961	242.5469	254.2630	392.2843	523.8445	531.4288	523.8716 (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	974.5693	947.0374	860.0774	716.8887	547.8272	365.2450	242.6037	254.3950	397.0565	607.5370	804.9029	968.8517 (97)
Space heating kWh	318.8760	220.1257	148.5997	46.9749	7.9140	0.0000	0.0000	0.0000	0.0000	62.2672	196.9013	331.0652 (98a)
Space heating requirement - total per year (kWh/year)	1332.7239											
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	318.8760	220.1257	148.5997	46.9749	7.9140	0.0000	0.0000	0.0000	0.0000	62.2672	196.9013	331.0652 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1332.7239											
Space heating per m2	(98c) / (4) =											
	19.9211 (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	318.8760	220.1257	148.5997	46.9749	7.9140	0.0000	0.0000	0.0000	0.0000	62.2672	196.9013	331.0652 (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)	345.4777	238.4894	160.9964	50.8937	8.5742	0.0000	0.0000	0.0000	0.0000	67.4618	213.3275	358.6839 (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	208.5175	184.2605	195.5699	171.7212	166.2624	149.6192	147.6065	153.6329	155.4843	173.5985	184.8308	206.2281 (64)
Efficiency of water heater	85.0093	84.4596	83.4518	81.5759	80.1692	79.8000	79.8000	79.8000	79.8000	81.9938	84.2019	79.8000 (216)
Fuel for water heating, kWh/month	245.2877	218.1639	234.3506	210.5048	207.3894	187.4927	184.9706	192.5224	194.8425	211.7213	219.5090	242.2922 (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	19.9202	15.9807	14.3889	10.5419	8.1429	6.6528	7.4282	9.6555	12.5415	16.4551	18.5860	20.4739 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-22.7958	-33.1961	-49.2758	-57.2837	-63.4091	-59.7934	-59.0686	-54.9566	-47.9726	-38.7997	-25.4373	-19.5872 (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	-9.8558	-21.0162	-42.2967	-64.2966	-85.7633	-86.4351	-85.4106	-71.9701	-52.3012	-30.3008	-13.2389	-7.7722 (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)												

Full SAP Calculation Printout



(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												1443.9045	(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												2549.0471	(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)												160.7675	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1102.2334	(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												3137.4858	(238)

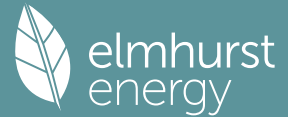
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1443.9045	0.2100	303.2200	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2549.0471	0.2100	535.2999	(264)
Space and water heating			838.5199	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	160.7675	0.1443	23.2037	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-531.5759	0.1339	-71.1780	
PV Unit electricity exported	-570.6575	0.1255	-71.6438	
Total			-142.8218	(269)
Total CO2, kg/year			730.8310	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9200	(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	1443.9045	1.1300	1631.6121	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2549.0471	1.1300	2880.4233	(278)
Space and water heating			4512.0354	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	160.7675	1.5338	246.5906	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-531.5759	1.4948	-794.6170	
PV Unit electricity exported	-570.6575	0.4608	-262.9729	
Total			-1057.5898	(283)
Total Primary energy kWh/year			3831.1370	(286)
Target Primary Energy Rate (TPER)			57.2700	(287)

Full SAP Calculation Printout



Property Reference	Be Green ASHP				Issued on Date	24/10/2025	
Assessment Reference	Flat 7			Prop Type Ref	Baseline		
Property							
SAP Rating	84 B	DER	3.15	TER	9.89		
Environmental	97 A	% DER < TER				68.15	
CO ₂ Emissions (t/year)	0.47	DFEE	29.90	TFEE	42.60		
Compliance Check	See BREL	% DFEE < TFEE				29.81	
% DPER < TPER	36.74	DPER	32.74	TPER	51.75		
Assessor Details	Mr. Neil Bradford				Assessor ID	T704-0001	
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)
Main dwelling			
Ground floor	166.0000 (1b)	2.5000 (2b)	415.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	166.0000		415.0000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	415.0000 (5)

2. Ventilation rate

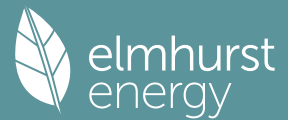
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.0482 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2982 (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) = 0.2982 (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	0.3802	0.3727	0.3653	0.3280	0.3206	0.2833	0.2833	0.2758	0.2982	0.3206	0.3355	0.3504 (22b)
Effective ac	0.5723	0.5695	0.5667	0.5538	0.5514	0.5401	0.5401	0.5380	0.5445	0.5514	0.5563	0.5614 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			22.0500	0.9615	21.2019		(27)
Solid door			2.1300	1.0000	2.1300		(26)
Roof Light			7.4400	0.9615	10.5283		(27a)
Mansard Roof wall	158.4600	22.0500	136.4100	0.1200	16.3692	9.0000	1227.6901 (29a)
Corridor walls	58.5900	2.1300	56.4600	0.1200	6.7752	190.0000	10727.4000 (29a)
Flat roof	166.0000	7.4400	158.5600	0.0861	13.6559	9.0000	1427.0400 (30)
Total net area of external elements Aum(A, m ²)			383.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.6605		(33)
Main dwelling							
Party Floor 1			166.0000			0.0000	0.0000 (32d)
Party Ceiling 1			74.0000			30.0000	2220.0000 (32b)
Internal Wall 1			211.6500			9.0000	1904.8499 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17506.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							105.4637 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				11.5200	0.0410	0.4723	
E3 Sill				10.5000	0.0060	0.0630	
E4 Jamb				25.2000	0.0100	0.2520	

Full SAP Calculation Printout



E7 Party floor between dwellings (in blocks of flats)	86.8200	0.0000	0.0000	
E14 Flat roof	86.8200	0.0490	4.2542	
E16 Corner (normal)	10.0000	0.0340	0.3400	
R11 Upstands or kerbs of rooflights	39.7800	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.3815 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		76.0420 (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	78.3730	77.9886	77.6119	75.8424	75.5113	73.9701	73.9701	73.6847	74.5637	75.5113	76.1810	76.8812 (38)
Heat transfer coeff	154.4150	154.0306	153.6539	151.8844	151.5533	150.0121	150.0121	149.7267	150.6057	151.5533	152.2231	152.9233 (39)
Average = Sum(39)m / 12 =												151.8828
HLP	0.9302	0.9279	0.9256	0.9150	0.9130	0.9037	0.9037	0.9020	0.9073	0.9130	0.9170	0.9212 (40)
HLP (average)												0.9150
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9572 (42)
Hot water usage for mixer showers												
130.3952	128.4356	125.5801	120.1166	116.0847	111.5883	109.0326	111.8665	114.9730	119.8007	125.3815	129.8956 (42a)	
Hot water usage for baths												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)	
Hot water usage for other uses												
44.9145	43.2812	41.6480	40.0147	38.3815	36.7482	36.7482	38.3815	40.0147	41.6480	43.2812	44.9145 (42c)	
Average daily hot water use (litres/day)												161.0514 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	175.3097	171.7168	167.2281	160.1313	154.4662	148.3366	145.7808	150.2480	154.9877	161.4487	168.6628	174.8101 (44)
Energy conte	277.6477	244.5225	257.0233	219.2118	207.9412	182.3971	176.3093	186.0384	191.1153	219.0843	240.2910	273.7103 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												
41.6472	36.6784	38.5535	32.8818	31.1912	27.3596	26.4464	27.9058	28.6673	32.8626	36.0437	41.0566 (46)	
Water storage loss:												
Store volume												80.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4300 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												0.8580 (55)
Total storage loss												
26.5980	24.0240	26.5980	25.7400	26.5980	25.7400	26.5980	26.5980	26.5980	25.7400	26.5980	25.7400	26.5980 (56)
If cylinder contains dedicated solar storage												
26.5980	24.0240	26.5980	25.7400	26.5980	25.7400	26.5980	26.5980	26.5980	25.7400	26.5980	25.7400	26.5980 (57)
Primary loss	31.1612	28.1456	31.1612	30.1560	31.1612	22.5120	23.2624	23.2624	22.5120	31.1612	30.1560	31.1612 (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												
335.4069	296.6921	314.7825	275.1078	265.7004	230.6491	226.1697	235.8988	239.3673	276.8435	296.1870	331.4695 (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	335.4069	296.6921	314.7825	275.1078	265.7004	230.6491	226.1697	235.8988	239.3673	276.8435	296.1870	331.4695 (64)
12Total per year (kWh/year)												3324.2747 (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	138.5252	123.0394	131.6676	117.6047	115.3478	99.2486	98.5112	101.7461	102.1474	119.0529	124.6136	137.2160 (65)

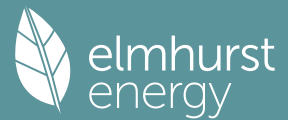
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
175.5000	194.3036	175.5000	181.3500	175.5000	181.3500	175.5000	175.5000	175.5000	181.3500	175.5000	181.3500	175.5000 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
337.4476	340.9492	332.1252	313.3398	289.6267	267.3397	252.4506	248.9490	257.7730	276.5584	300.2715	322.5585 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859 (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)												
-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873 (71)
Water heating gains (Table 5)												
186.1898	183.0944	176.9726	163.3399	155.0374	137.8453	132.4075	136.7555	141.8715	160.0173	173.0744	184.4302 (72)	
Total internal gains	766.4951	785.7049	751.9555	725.3875	687.5218	653.8928	627.7159	628.5622	648.3522	679.4335	722.0537	749.8464 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast				8.8200	11.2829		0.5700		0.0000		0.7700		43.6774 (75)
Southwest				13.2300	36.7938		0.5700		0.0000		0.7700		213.6488 (79)
North				7.4400	26.0000		0.6300		0.0000		1.0000		121.8672 (82)
Solar gains	379.1934	705.9383	1108.0878	1583.1097	1944.6049	2000.4809	1899.9736	1623.1950	1273.3700	820.2184	465.5371	316.9392	(83)
Total gains	1145.6885	1491.6432	1860.0433	2308.4972	2632.1268	2654.3737	2527.6895	2251.7573	1921.7223	1499.6519	1187.5907	1066.7856	(84)

Full SAP Calculation Printout



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	31.4934	31.5720	31.6494	32.0181	32.0881	32.4177	32.4177	32.4795	32.2899	32.0881	31.9469	31.8006
alpha	3.0996	3.1048	3.1100	3.1345	3.1392	3.1612	3.1612	3.1653	3.1527	3.1392	3.1298	3.1200
util living area	0.9534	0.9061	0.8201	0.6660	0.4976	0.3523	0.2584	0.3008	0.5020	0.7769	0.9207	0.9613 (86)
Living	19.4694	19.8136	20.2235	20.6111	20.8055	20.8785	20.8959	20.8919	20.8301	20.5038	19.9124	19.4101
Non living	18.7318	19.0677	19.4597	19.8212	19.9885	20.0526	20.0641	20.0636	20.0172	19.7378	19.1765	18.6797
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	20.2170	19.8136	20.2235	20.6111	20.8055	20.8785	20.8959	20.8919	20.8301	20.5038	19.9124	19.6325 (87)
Th 2	20.1419	20.1439	20.1458	20.1548	20.1565	20.1644	20.1644	20.1658	20.1613	20.1565	20.1531	20.1495 (88)
util rest of house	0.9470	0.8944	0.7999	0.6351	0.4594	0.3089	0.2103	0.2481	0.4500	0.7450	0.9088	0.9559 (89)
MIT 2	19.4206	19.0677	19.4597	19.8212	19.9885	20.0526	20.0641	20.0636	20.0172	19.7378	19.1765	18.8853 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.6640	19.2957	19.6932	20.0627	20.2383	20.3051	20.3184	20.3168	20.2657	19.9720	19.4015	19.1137 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6640	19.2957	19.6932	20.0627	20.2383	20.3051	20.3184	20.3168	20.2657	19.9720	19.4015	19.1137 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9430	0.8811	0.7882	0.6316	0.4632	0.3163	0.2192	0.2577	0.4567	0.7374	0.8962	0.9480 (94)
Useful gains	1080.3285	1314.2157	1466.0882	1458.0786	1219.2362	839.4938	554.1374	580.2908	877.6549	1105.8791	1064.3428	1011.3187 (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	2372.4390	2217.3846	2027.1902	1695.4402	1294.0001	855.8368	557.8061	586.4474	928.5937	1420.3534	1872.5699	2280.6588 (97)
Space heating kWh	961.3302	606.9295	417.4599	170.9004	55.6244	0.0000	0.0000	0.0000	0.0000	233.9689	581.9235	944.3891 (98a)
Space heating requirement - total per year (kWh/year)												3972.5258
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	961.3302	606.9295	417.4599	170.9004	55.6244	0.0000	0.0000	0.0000	0.0000	233.9689	581.9235	944.3891 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3972.5258
Space heating per m2										(98c) / (4) =		23.9309 (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 %)												257.3275 (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	961.3302	606.9295	417.4599	170.9004	55.6244	0.0000	0.0000	0.0000	0.0000	233.9689	581.9235	944.3891 (98)
Space heating efficiency (main heating system 1)	257.3275	257.3275	257.3275	257.3275	257.3275	0.0000	0.0000	0.0000	0.0000	257.3275	257.3275	257.3275 (210)
Space heating fuel (main heating system)	373.5824	235.8588	162.2290	66.4136	21.6162	0.0000	0.0000	0.0000	0.0000	90.9226	226.1412	366.9989 (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	335.4069	296.6921	314.7825	275.1078	265.7004	230.6491	226.1697	235.8988	239.3673	276.8435	296.1870	331.4695 (64)
Efficiency of water heater	177.8454	177.8454	177.8454	177.8454	177.8454	177.8454	177.8454	177.8454	177.8454	177.8454	177.8454	177.8454 (216)
Fuel for water heating, kWh/month	188.5946	166.8259	176.9979	154.6893	149.3996	129.6908	127.1721	132.6426	134.5929	155.6653	166.5419	186.3807 (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	46.4143	37.2353	33.5262	24.5627	18.9730	15.5011	17.3078	22.4973	29.2218	38.3405	43.3056	47.7043 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-7.1031	-12.7140	-23.5774	-33.0560	-41.1201	-40.2254	-39.3376	-33.8360	-25.3321	-16.4493	-8.5290	-5.7826 (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												1543.7627 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												177.8454
Water heating fuel used												1869.1937 (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)												374.5898 (232)

Full SAP Calculation Printout



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

PV generation	-287.0625	(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	3500.4837	(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	1543.7627	0.1568	242.1365 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1869.1937	0.1412	264.0087 (264)
Space and water heating			506.1452 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	374.5898	0.1443	54.0649 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-287.0625	0.1306	-37.4954
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-37.4954 (269)
Total CO2, kg/year			522.7146 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.1500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1543.7627	1.5806	2440.0750 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1869.1937	1.5223	2845.4406 (278)
Space and water heating			5285.5156 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	374.5898	1.5338	574.5583 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-287.0625	1.4825	-425.5735
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-425.5735 (283)
Total Primary energy kWh/year			5434.5004 (286)
Dwelling Primary energy Rate (DPER)			32.7400 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

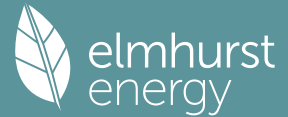
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	166.0000 (1b)	x 2.5000 (2b)	= 415.0000 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	166.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 415.0000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.0964 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3464 (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) = 0.3464 (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	0.4416	0.4330	0.4243	0.3810	0.3724	0.3291	0.3291	0.3204	0.3464	0.3724	0.3897	0.4070 (22b)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828 (25)

Full SAP Calculation Printout



3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.1300	1.0000	2.1300		(26)
TER Opening Type			22.0500	1.1450	25.2481		(27)
TER Roof Light			7.4400	1.5918	15.0441		(27a)
Mansard Roof wall	158.4600	22.0500	136.4100	0.1800	24.5538		(29a)
Corridor walls	58.5900	2.1300	56.4600	0.1800	10.1628		(29a)
Flat roof	166.0000	7.4400	158.5600	0.1100	17.4416		(30)
Total net area of external elements Aum (A, m2)			383.0500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		94.5804		(33)

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

109.9216 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	11.5200	0.0500	0.5760
E3 Sill	10.5000	0.0500	0.5250
E4 Jamb	25.2000	0.0500	1.2600
E7 Party floor between dwellings (in blocks of flats)	86.8200	0.0700	6.0774
E14 Flat roof	86.8200	0.0800	6.9456
E16 Corner (normal)	10.0000	0.0900	0.9000
R11 Upstands or kerbs of rooflights	39.7800	0.0800	3.1824

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

19.4664 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 114.0468 (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	81.8309	81.3122	80.8039	78.4162	77.9694	75.8898	75.8898	75.5047	76.6908	77.9694	78.8732	79.8180
Average = Sum(39)m / 12 =	195.8777	195.3590	194.8507	192.4630	192.0162	189.9366	189.9366	189.5515	190.7376	192.0162	192.9200	193.8648

192.4608 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1800	1.1769	1.1738	1.1594	1.1567	1.1442	1.1442	1.1419	1.1490	1.1567	1.1622	1.1679
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

1.1594 (40)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9572 (42)
Hot water usage for mixer showers													
94.8329	93.4077	91.3310	87.3575	84.4252	81.1552	79.2964	81.3575	83.6167	87.1278	91.1866	94.4695	94.4695	(42a)
Hot water usage for baths													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
44.9145	43.2812	41.6480	40.0147	38.3815	36.7482	36.7482	38.3815	40.0147	41.6480	43.2812	44.9145	44.9145	(42c)
Average daily hot water use (litres/day)													128.2641 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	139.7474	136.6890	132.9790	127.3723	122.8067	117.9034	116.0447	119.7389	123.6314	128.7758	134.4678	139.3840
Energy content (annual)	221.3257	194.6432	204.3837	174.3663	165.3214	144.9760	140.3460	148.2618	152.4499	174.7475	191.5740	218.2417

218.2417 (45)

Distribution loss (46)m = 0.15 x (45)m

Total = Sum(45)m = 2130.6372

Water storage loss:

Store volume

80.0000 (47)

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

0.9749 (48)

Temperature factor from Table 2b

0.5400 (49)

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

0.5264 (55)

Total storage loss

16.3190 14.7398 16.3190 15.7926 16.3190 15.7926 16.3190 16.3190 15.7926 16.3190 15.7926 16.3190 16.3190 (56)

If cylinder contains dedicated solar storage

16.3190 14.7398 16.3190 15.7926 16.3190 15.7926 16.3190 16.3190 15.7926 16.3190 15.7926 16.3190 16.3190 (57)

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

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

Total heat required for water heating calculated for each month

260.9071 230.3942 243.9651 212.6709 204.9029 183.2806 179.9274 187.8432 190.7545 214.3289 229.8786 257.8231 (62)

WWHRS -43.3536 -38.3423 -40.1498 -33.2457 -30.9838 -26.5130 -24.8517 -26.4273 -27.4314 -32.3386 -36.6357 -42.5508 (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 -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 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 0.0000 (63d)

Output from w/h

217.5534 192.0519 203.8153 179.4252 173.9191 156.7675 155.0757 161.4159 163.3231 181.9903 193.2429 215.2723 (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 0.0000 (64a)

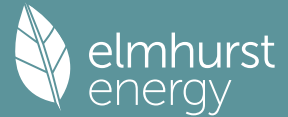
Heat gains from water heating, kWh/month

105.2559 93.3196 99.6227 88.6205 86.6345 78.8482 78.3302 80.9622 81.3333 89.7687 94.3420 104.2305 (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	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591	147.8591
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	172.8608	191.3816	172.8608	178.6228	172.8608	178.6228	172.8608	172.8608	178.6228	172.8608	178.6228	172.8608
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	337.4476	340.9492	332.1252	313.3398	289.6267	267.3397	252.4506	248.9490	257.7730	276.5584	300.2715	322.5585
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859	37.7859
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
Losses e.g. evaporation (negative values) (Table 5)	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873	-118.2873
Water heating gains (Table 5)	141.4730	138.8685	133.9015	123.0840	116.4442	109.5114	105.2825	108.8201	112.9629	120.6568	131.0306	140.0947
Total internal gains												

Full SAP Calculation Printout



722.1391 741.5571 709.2452 685.4044 649.2895 622.8316 597.9516 597.9876 616.7165 640.4337 680.2827 705.8718 (73)

6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast	8.8200		11.2829		0.6300		0.7000		0.7700		30.4132 (75)	
Southwest	13.2300		36.7938		0.6300		0.7000		0.7700		148.7670 (79)	
North	7.4400		26.0000		0.6300		0.7000		1.0000		76.7763 (82)	
Solar gains	255.9566	474.7709	741.7388	1055.7190	1294.3787	1330.7993	1264.2337	1081.4552	850.9216	550.6159	313.9032	214.1622 (83)
Total gains	978.0957	1216.3279	1450.9840	1741.1233	1943.6682	1953.6310	1862.1854	1679.4428	1467.6380	1191.0496	994.1859	920.0340 (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	25.8764	25.9451	26.0128	26.3355	26.3968	26.6858	26.6858	26.7400	26.5737	26.3968	26.2731	26.1451
alpha	2.7251	2.7297	2.7342	2.7557	2.7598	2.7791	2.7791	2.7827	2.7716	2.7598	2.7515	2.7430
util living area	0.9736	0.9528	0.9142	0.8296	0.7022	0.5468	0.4207	0.4752	0.6936	0.8868	0.9580	0.9774 (86)
MIT	18.3379	18.7173	19.2759	19.9780	20.5131	20.8288	20.9393	20.9142	20.6543	19.9119	19.0033	18.2827 (87)
Th 2	19.9360	19.9386	19.9410	19.9526	19.9548	19.9649	19.9649	19.9668	19.9610	19.9548	19.9504	19.9458 (88)
util rest of house	0.9692	0.9452	0.9003	0.8023	0.6555	0.4769	0.3315	0.3828	0.6287	0.8622	0.9499	0.9737 (89)
MIT 2	16.8208	17.3016	18.0034	18.8696	19.4931	19.8347	19.9323	19.9173	19.6705	18.8128	17.6765	16.7562 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.2846	17.7344	18.3924	19.2084	19.8050	20.1386	20.2402	20.2221	19.9713	19.1488	18.0821	17.2229 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.2846	17.7344	18.3924	19.2084	19.8050	20.1386	20.2402	20.2221	19.9713	19.1488	18.0821	17.2229 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9531	0.9234	0.8741	0.7796	0.6481	0.4892	0.3561	0.4067	0.6294	0.8384	0.9297	0.9592 (94)
Useful gains	932.2715	1123.1115	1268.3729	1357.4468	1259.7673	955.8010	663.0372	683.0568	923.7466	998.5732	924.2985	882.4951 (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	2543.3943	2507.3167	2317.2476	1983.9924	1556.2834	1051.9918	691.4017	724.4782	1119.8775	1641.5145	2118.6711	2524.6763 (97)
Space heating kWh	1198.6754	930.1859	780.3628	451.1128	220.6080	0.0000	0.0000	0.0000	0.0000	478.3483	859.9483	1221.7828 (98a)
Space heating requirement - total per year (kWh/year)	6141.0242											
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	1198.6754	930.1859	780.3628	451.1128	220.6080	0.0000	0.0000	0.0000	0.0000	478.3483	859.9483	1221.7828 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	6141.0242											
Space heating per m2	(98c) / (4) = 36.9941 (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	1198.6754	930.1859	780.3628	451.1128	220.6080	0.0000	0.0000	0.0000	0.0000	478.3483	859.9483	1221.7828 (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)	1298.6732	1007.7853	845.4635	488.7463	239.0119	0.0000	0.0000	0.0000	0.0000	518.2538	931.6883	1323.7084 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	217.5534	192.0519	203.8153	179.4252	173.9191	156.7675	155.0757	161.4159	163.3231	181.9903	193.2429	215.2723 (64)
Efficiency of water heater	87.2877	87.1185	86.7733	86.0387	84.5942	79.8000	79.8000	79.8000	79.8000	86.1230	86.9997	79.8000 (216)
Fuel for water heating, kWh/month	249.2371	220.4489	234.8825	208.5400	205.5923	196.4505	194.3304	202.2756	204.6656	211.3143	222.1192	246.5195 (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	35.9171	28.8140	25.9438	19.0075	14.6820	11.9953	13.3934	17.4092	22.6129	29.6693	33.5114	36.9153 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-52.4765	-74.3513	-107.3638	-121.2213	-131.0373	-122.2976	-120.6591	-113.6806	-101.5294	-85.1172	-57.7732	-45.3153 (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	-28.5424	-60.1665	-119.8565	-180.4577	-239.1064	-240.5415	-237.8393	-201.2646	-147.2816	-86.3429	-38.1945	-22.5721 (233b)

Full SAP Calculation Printout



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													6653.3307	(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													2596.3758	(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)													289.8712	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-2734.9886	(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													6890.5891	(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	6653.3307	0.2100	1397.1994 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2596.3758	0.2100	545.2389 (264)
Space and water heating			1942.4384 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	289.8712	0.1443	41.8374 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1132.8227	0.1345	-152.3819
PV Unit electricity exported	-1602.1659	0.1258	-201.5697
Total			-353.9516 (269)
Total CO2, kg/year			1642.2534 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.8900 (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	6653.3307	1.1300	7518.2637 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2596.3758	1.1300	2933.9047 (278)
Space and water heating			10452.1684 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	289.8712	1.5338	444.6142 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1132.8227	1.4971	-1695.9963
PV Unit electricity exported	-1602.1659	0.4618	-739.8911
Total			-2435.8873 (283)
Total Primary energy kWh/year			8590.9961 (286)
Target Primary Energy Rate (TPER)			51.7500 (287)

B.GHA Overheating Tool

EARLY STAGE OVERHEATING RISK TOOL

Version 1.0, July 2019



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

The questions can be answered for an overall scheme or for individual units. Score zero wherever the question does not apply.

Additional information is provided in the accompanying guidance, with examples of scoring and advice on next steps.

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

KEY FACTORS INCREASING THE LIKELIHOOD OF OVERHEATING

KEY FACTORS REDUCING THE LIKELIHOOD OF OVERHEATING

Geographical and local context

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

#8 Do the site surroundings feature significant blue/green infrastructure?

Proximity to green spaces and large water bodies has beneficial effects on local temperatures; as guidance, this would require at least 50% of surroundings within a 100m radius to be blue/green, or a rural context

1 0

Site characteristics

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

#9 Are immediate surrounding surfaces in majority pale in colour, or blue/green?

Lighter surfaces reflect more heat and absorb less so their temperatures remain lower; consider horizontal and vertical surfaces within 10m of the scheme

1 0

#10 Does the site have existing tall trees or buildings that will shade solar-exposed glazed areas?

Shading onto east, south and west facing areas can reduce solar gains, but may also reduce daylight levels

1 0

Scheme characteristics and dwelling design

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

#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation?

Thermal mass can help slow down temperature rises, but it can also cause properties to be slower to cool, so needs to be used with care - see guidance

1 1

#12 Do floor-to-ceiling heights allow ceiling fans, now or in the future?

Higher ceilings increase stratification and air movement, and offer the potential for ceiling fans

>2.8m and fan installed	2	0
> 2.8m	1	

Solar heat gains and ventilation

#6 What is the estimated average glazing ratio for the dwellings? (as a proportion of the facade on solar-exposed areas i.e. orientations facing east, south, west, and anything in between). Higher proportions of glazing allow higher heat gains into the space	>65%	12	4
	>50%	7	
	>35%	4	
#7 Are the dwellings single aspect? Single aspect dwellings have all openings on the same facade. This reduces the potential for ventilation	Single-aspect	3	0
	Dual aspect	0	

#13 Is there useful external shading?

Shading should apply to solar exposed (E/S/W) glazing. It may include shading devices, balconies above, facade articulation etc. See guidance on "full" and "part". Scoring depends on glazing proportions as per #6

	Full	Part	1
>65%	6	3	
>50%	4	2	
>35%	2	1	

#14 Do windows & openings support effective ventilation?

Larger, effective and secure openings will help dissipate heat - see guidance

	Openings compared to Part F purge rates		2
	= Part F	+50% +100%	
Single-aspect	minimum required	3 4	2
Dual aspect	minimum required	2 3	

TOTAL SCORE **9** = Sum of contributing factors: **13**

minus

Sum of mitigating factors: **4**

High

12

Medium

8

Low

score >12:

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

score between 8 and 12:

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

score <8:

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