Eastmere Stables

Energy Statement

October 2024

CONTENTS

1	Executive Summary	3
2	Policy Framework	4
3	Energy Calculations	7
4	Renewable Energy	10
5	Water Efficiency	13
6	Conclusion	14

Appendix 1 – Carbon Emissions Spreadsheet

Appendix 2 – SAP Calculations (Pre Renewable Energy)

Appendix 3 – SAP Calculations – Final Proposed

Appendix 3 – Sample ASHP Details

Document Control Sheet	
Report Reference	PP2516/ES/ES/202409-NR
Report Revision	-
Issue Purpose	For Planning
Report Prepared For:	Eastmere Paddocks Ltd
Report Author:	Neil Rothon
Approved By:	Ryan Thrower
Date of Issue:	2nd October 2024

Disclaimer

The contents of this report are based on drawings, specifications, and information provided, supplemented by assumptions made by NRG to achieve compliance.

NRG bears no responsibility to third parties for any use or interpretation of this report. Third parties act on the report's contents at their own risk.

The use of this report is exclusively reserved for the named client only, unless accompanied by a signed letter of reliance.

This report has been produced by NRG Consulting (NRG) to support a Planning Application. It should not be relied upon at construction stage, for Building Control compliance, or to be used in the discharge of Planning Conditions.

1 Executive Summary

NRG Consulting have been commissioned to undertake an Energy Statement on a proposed development at **Eastmere Stables, Eastergate Lane, Eastergate, PO20 3SJ.**

The description of development is:

A 9-unit scheme of 2-3-4 bedroom dwellings inclusive of 2 bungalows.

This document illustrates a reduction in CO_2 emissions over Part L of the Building Regulations (2021) via:

Energy Efficiency

- U-Values have been set to maximise fabric efficiency and reduce energy demand.
- LED Lighting with a minimum efficacy of 85lm/w L is proposed.
- An Air Permeability target of 3 $m^3/(hm^2)$ @50Pa has been set

Renewable Energy

The on-site provision of renewable energy has been prioritised and following a feasibility review, the following technologies will be provided:

- Air Source Heat Pumps

Through these measures, compliance with the requirements of the Local Authority have been exceeded and a low-carbon and sustainable development is proposed.

	CO_2 Emissions (Tonnes per Annum)
	Residential
Baseline: Part L 2021 of the Building Regulation (TER)	**13.5**
CO_2 Emissions Pre-Renewable Energy	**11.5**
Final CO_2 Emissions of Proposed Development (DER)	**5.7**
CO_2 Savings over Part L 2021	**57.8%**
CO_2 Savings by Renewable Energy	**50%**

Table: Carbon Emissions Table

2 Policy Framework

The proposed development is classified as a **minor** development.

2.1 National Planning Policy Framework (NPPF) (2023)

The NPPF was updated in December 2023 and contains the following text regarding *sustainable development.*

Achieving Sustainable Development *(Paragraphs 7 to 14):*

The purpose of the planning system is to contribute to the achievement of sustainable development. This includes three overarching objectives:

An economic objective: To help build a strong, responsive, and competitive economy.
A social objective: To support strong, vibrant, and healthy communities.
An environmental objective: To protect and enhance our natural, built, and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

Presumption in Favour of Sustainable Development *(Paragraph 11):*

Plans and decisions should apply a presumption in favour of sustainable development. This includes promoting a sustainable pattern of development that seeks to meet the development needs of their area; align growth and infrastructure; improve the environment; mitigate climate change (including by making effective use of land in urban areas) and adapt to its effects.

2.2 Local Policy

Arun District Council - The Arun Local Plan 2011-2031 (2018)

Policy ECC SP2

Energy and climate change mitigation

All new residential and commercial development (including conversions, extensions and changes of use) will be expected to be energy efficient and to demonstrate how they will:

a. Achieve energy efficiency measures that reflect the current standards applicable at the time of submission;
b. Use design and layout to promote energy efficiency; and
c. Incorporate decentralised, renewable and low carbon energy supply systems, for example small scale renewable energy systems such as solar panels.

All major developments[47] must produce 10% of the total predicted energy requirements from renewable or low carbon energy generation on site, unless it can be demonstrated that this is unviable. Energy efficiency measures will be taken into consideration when the total predicted energy requirements are calculated. The Council will consider 'allowable solutions' where it is clearly demonstrated that the provision of on site renewable or low carbon energy generation is unviable or not feasible.

Where planning permission is required to retrofit energy efficiency measures into existing development, schemes will be permitted, subject to the Design and Built Heritage policies.

In assessing the achievement of these standards the Council will consider:

- Site constraints;
- Technical viability;
- Financial viability; and
- Delivery of additional benefits.

Policy ECC DM1

Renewable energy

The Council will support renewable energy development subject to the criteria in this Policy. Schemes will be expected to contribute to the social, economic and environmental development and overall regeneration of the District.

Within areas of protected landscapes, areas or buildings, development should generally be small scale or community based.

2.3 Supplementary Planning Documents (SPDs)

The Arun District Design Guide SPD (2024)

The following sections of this SPD have been considered relevant in the production of this report:

- K.01 Energy & Carbon
- K.02 Water & Material Management
- K.03 Adapting to Climate Change

K.01 Energy & Carbon

Maximise energy efficiency and minimise whole life carbon.

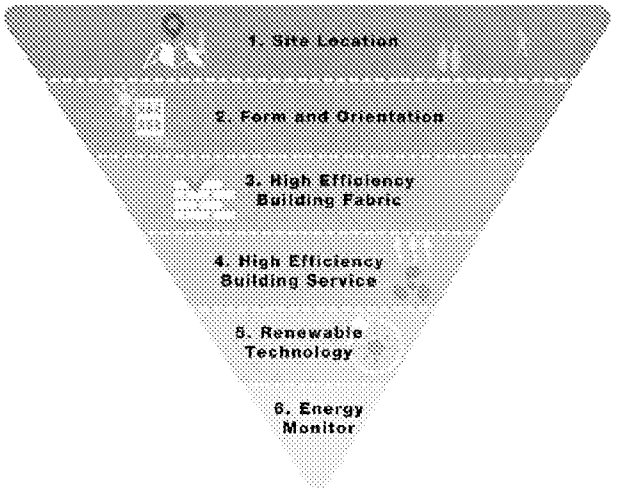
All new development including conversions, extensions and changes of use must be designed to reduce energy demand and carbon emissions in line with national and local standards including the Arun Local Plan.

Approaches to design must demonstrate that each step of the energy hierarchy set out in Figure 233 has been followed whilst also ensuring the incorporation of low and zero carbon (LZC) technologies and clear commitments to comprehensive energy monitoring and transparency of performance.

Passive design should be the first step, considering form and orientation, effective insulation, air-tightness and utilising natural ventilation where this can avoid the risk of overheating, both today and in the future. Existing buildings should incorporate retrofitting measures such as cavity wall insulation and additional glazing, but these interventions must be supported by detailed analysis of moisture risk.

Large development should consider others in proximity with which a heat network could be established to meet energy demand.

Figure 230: The Energy Hierarchy



Energy & Carbon - Make sure the scheme:	Tick when Addressed
• Sets targets for energy and carbon reductions beyond the relevant Part L Building Regulations	☐
• Demonstrates consideration of embodied carbon (emissions from the manufacture, transport and construction of building materials, together with end of life emissions).	☐
• Incorporates passive solar design measures such as avoiding single aspects, including south facing windows on habitable rooms, minimising north-facing glazing, using roof lights and sunpipes and providing shading to south facing windows through tree cover.	☐
• Uses heat recovery systems wherever mechanical ventilation is installed (MVHR).	☐
• Considers the ventilation strategy alongside proposed air tightness levels, to ensure buildings are not left susceptible to mould growth. This may include hydrothermal modelling.	☐

Feasibility studies should be carried out to explore a range of passive design measures and low and zero carbon technologies appropriate to the site, to reduce energy consumption to a minimum. Following the energy hierarchy, once maximum savings have been achieved through passive design, a further minimum 10% of the energy requirement should be generated through on-site renewable or low carbon technologies.

2.4 Part L of the Building Regulations (2021)

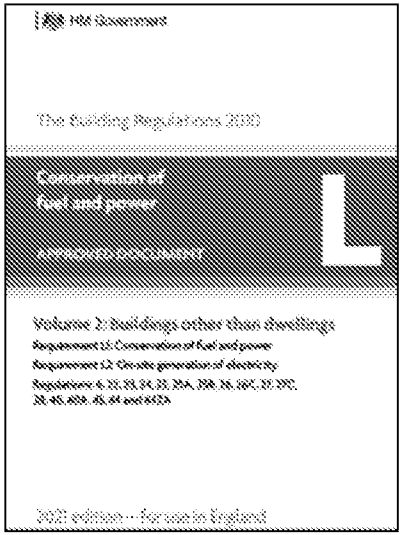
In July 2018 the then Department for Business Energy & Industrial Strategy (BEIS) published their proposed update to SAP 9.92 (Part L 2013), called SAP 10.

In June 2022, Part L 2021 of the Building Regulations came into force. As per the requirements, all new homes must produce 31% less CO_2 emissions than that of Part L 2013 in-order to achieve Building Regulation compliance.

One of the major changes in the regulations was the change in carbon factor of electricity to represent the decarbonisation of the National Grid and the push towards net-zero carbon developments.

Part L 2021 also introduced three targets for Part L compliance:

- TER Target Emission Rate
- TPER Target Primary Energy Rate
- TFEE Target Fabric Energy Efficiency



2.5 The Future Homes and Buildings Standard

In October 2019, the then Ministry of Housing, Communities and Local Government (MHCLG) issued a consultation on changes to Part L. Dubbed *The Future Homes Standard*, it was an aspiration to ensure all new homes will have low carbon heating and "world-leading levels of energy efficiency" by 2025 and was intended to be the primary driver in achieving the net-zero carbon commitment made by the Government.

On 13th December 2023, consultation documents were issued by the Department for Levelling Up, Housing and Communities for *The Future Homes and Buildings Standard.* While still at a consultation age, this document details potential scenarios in how new build dwellings and buildings in the UK will become *net-zero ready.* The published proposals however contain two options and the final choice will not be made until the end of 2024.

A separate consultation was published to discuss the withdrawal of the Standard Assessment Procedure (SAP) and replace it with a Home Energy Model (HEM).

Key points within the consultation document are:

- Removal of Gas Boilers from the Notional Dwelling Specification and;
- Fossil fuel-powered boilers in new buildings will be prohibited from 2025
- Further reduction in the carbon factor of electricity as the grid-decarbonises.
- Hybrid & hydrogen-ready boilers "will not meet the proposed standards"
- No major changes to M&E or Fabric requirements from Part L 2021.

Fuel	Part L 2013 ($kg/CO_2/kWh$)	Part L 2021 ($kg/CO_2/kWh$)	Part L 2025 ($kg/CO_2/kWh$)	Percentage Reduction
Electricity	0.519	0.233	0.086	73.8%

Table: *Change in Carbon Factor for Electricity from Part L 2013 to Part L 2025*

3 Energy Calculations

3.1 Energy Calculations

To estimate the CO_2 emissions for the site, SAP calculations have been carried out by an accredited OCDEA Domestic Energy Assessor using Design SAP 10's online platform.

The baseline CO_2 emissions covered by Part L 2021 of the Building Regulations are expressed as the Target Emission Rate (TER) and the proposed actual emissions are the Dwelling Emission Rate (DER). These use the unit of measurement of kilograms of CO_2 per square-metre per annum ($kg/CO_2/m^2$). To calculate the overall proposed emissions, these figures can be multiplied by the size of the dwellings and/or site and this figure is presented in tonnes/annum. This is the figure expressed within this report.

This covers regulated carbon emissions from:

- Heating (and Cooling)
- Hot Water
- Lighting
- Auxiliary (Pumps and Fans)

3.2 Passive Design Measures

Passive measures utilised in the concept and development of the design include:

- High levels of insulation more than the Part L 2021 notional values.
- Through good design, air infiltration will be minimised.
- Where possible, orientation and site layout to reduce energy demand.
- Provision of cross-ventilation.
- A high-performance glazing system to reduce heat demand and increase solar gains.

Element	Part L1 Limiting U-Vales	Proposed U-Values (W/m^2K)
Walls		
External Wall	*0.26 W/m²K*	0.16 W/m²K
Floors		
Floor	*0.18 W/m²K*	0.10 W/m²K
Roof		
Main Roof	*0.16 W/m²K*	0.12 W/m²K
Sloping Roof	*0.16 W/m²K*	0.16 W/m²K
Openings		
Windows	*1.6 W/m²K*	1.2 W/m²K
Rooflights	*1.6 W/m²K*	1.3 W/m²K
Doors	*1.6 W/m²K*	1.2 W/m²K
Air Permeability		
3 $m^3/(hm^2)$ @50Pa		
Thermal Bridging		
Recognised Construction Details		

Table: Proposed Fabric Specification

3.3 Active Design

The development will incorporate efficient building services to limit carbon emissions, including a zero-NO_x heating system, smart metering and the following measures:

Element	Proposed Details
Ventilation	**Natural Ventilation (Intermittent Fans and Trickle Vents)**
Heating	**Air Source Heat Pump (ASHP)**
Heating Controls	**Time and Temperature Zone Controls**
Heat Emitters	**Radiators**
Hot Water	**Hot Water Cylinder**
Lighting	**LED**
Cooling	**No**

Table: Proposed Mechanical and Electrical Specification

3.4 Lighting

In-line with exceeding Part L minimum requirements, all residential light fittings should be Light Emitting Diodes (LEDs) with a luminous efficiency per circuit watt of at least 85 lumens/Watt.

3.5 Pre-Renewable Scenario

In order to calculate the savings solely by renewable energy, a set of SAPs have been produced with direct electric heating instead of the proposed Air Source Heat Pump. All other inputs remain the same. This allows for a Pre-Renewable or Energy Efficiency scenario to be created. The carbon savings for this scenario can then be compared against those solely through the ASHP and against Part L 2021.

3.6 Unregulated Emissions

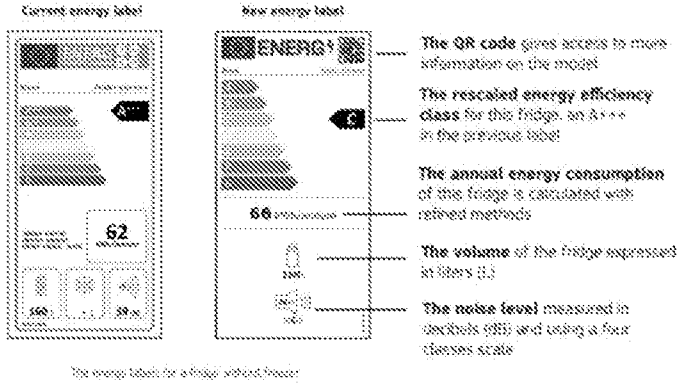
Unregulated energy use and their carbon emissions are from systems or processes that are harder to quantify than regulated emissions which are from fixed systems.

Unregulated energy is not counted within SAP for the purpose of Part L compliance. This is because the emissions from these items are variable and dependant on occupant behaviour and specification i.e. different levels of White Good provision and use and amount of small power equipment used.

For the proposed residential units, unregulated emissions consist of:

- Equipment (Small Power devices)
- Cooking
- External Lighting
- Appliances

In March 2021 the energy labelling ratings for appliances were updated, and are now rated simply A-G. What may have been an A+++ before might now be a B or even a C rating. Very few appliances achieve an A rating currently, as the new system leaves room for the industry to improve. Therefore, appliances should be sourced with the highest rating available (typically B or C currently).



3.7 Overheating

This development will be compliant with Part O of the Building Regulations and a full overheating assessment will be undertaken at RIBA Stage 4.

The scheme has been designed to avoid overheating with the early stages of the cooling hierarchy prioritised and with the following being major factors in mitigating potential risk:

- Individual heating is proposed thus no communal heat distribution to factor in.
- Windows are openable for the purpose of overheating management.

On this page the cooling hierarchy is examined to highlight the measures introduced to mitigate the potential for overheating.

3.8 Energy Monitoring

It is a requirement of the Councils SPD that there should be *comprehensive energy monitoring and transparency of performance.*

For this scheme, a Smart Meter will be installed and further to that, Air Source Heat Pumps like the make and model specified have IoT features and are app controlled so they have the ability too:

- Control the temperature remotely, even when the resident is not at home.
- View real-time consumption details in terms of kWh and cost.
- View historic consumption data allowance for seasonal performance to be reviewed.
- Allow for further connection to IoT ecosystems such as Alexa and Apple Homekit

Cooling Hierarchy	Measures Undertaken
Reduce the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure.	High albedo materials will be prioritised where possible.
	Insulation levels in-line with Part L 2021 have been proposed.
Minimise internal heat generation through energy efficient design:	Individual heating proposed so no communal heat distribution.
	LED lighting will reduce internal heat gains.
Manage the heat within the building through exposed internal thermal mass and high ceilings:	Level of exposed thermal mass has been maximised where possible, but it is likely that studwork will be used for internal partitions.
	The Floor to Ceiling Height complies with National Space Standards.
Provide Passive Ventilation	Openable Windows are proposed to all dwellings which will allow for nighttime purge ventilation if required.
	The dwellings benefits from the provision of cross-ventilation
Provide Mechanical Ventilation	Natural Ventilation is being provided

4 Renewable Energy

Renewable Energy is typically defined as:

"Energy derived from a source that is continually replenished, such as wind, wave, solar, hydroelectric and energy from plant material, but not fossil fuels or nuclear energy. Although not strictly renewable, geothermal energy is generally included."

As per Renewable Energy Directive (2018/2001/EU) aerothermal and hydrothermal technologies are also officially included within the definition.

Based on recent legislation including the *Clean Air Act* and *The Future Homes and Buildings Standards: 2023 consultation* as well as the location of the scheme, the following technologies have been discounted and are not discussed further:

- Wind Turbines
- Hydropower / Wave Technology
- Biogas / Biofuel / Biomass
- Hydrogen
- Hybrid Heat Pumps

The feasibility of remaining renewable and low carbon technologies has been undertaken based on the following parameters:

1. Practicality of installation of the technology
2. Energy demand profile for the project
3. Environmental impact & land use
4. Economic feasibility and overall payback (including available financial incentives)
5. Planning and regulatory issues i.e. conservation and heritage areas and aspects
6. Noise & aesthetic considerations

It should be noted that due to decarbonisation and the decrease in carbon factor for electricity, factors such as energy security and lowering running costs are deemed equal or more important to that of the offset of CO_2.

Photovoltaic Panels (PV)

The main benefit of PV has evolved in recent times from financial (Feed-In-Tariff era) to CO_2 offset (Part 2013) to currently providing a tangible saving on energy bills with a correctly sized and installed system. While system costs are higher in 2024 due to inflation and shipping costs, a domestic directly inverted system of 5kWp has a payback of around 7 years and can assist towards the reduction of energy bills.

PV panel systems without battery systems face significant inefficiencies due to the seasonal mismatch between power generation and energy demand. These panels generate the most power during summer, when daylight is abundant, but this coincides with lower energy demand. In winter, when energy demand peaks, PV output is significantly reduced.

The technology does benefits from having no noise implications, creates no additional land-use and when correctly specified has very limited aesthetic impact.

The CO_2 offset of PV in Part L 2025 is projected to be 36.76% less than Part L 2021 therefore carbon savings for the technology are set to further diminish as the grid decarbonises.

For this scheme, other technologies are preferred due to the very low CO_2 savings that the technology offers.

Solar Hot Water

Solar Hot Water can provide free hot water to a dwelling, mainly during the summer months thus it requires a high hot water demand to be at its most effective and offer a sufficient payback. However, when the dwelling is heated by a renewable source like an ASHP, this reduces the renewable energy generated due to an overlap in provision.

To avoid high pipework heat losses, it is recommended that pipe runs are as small as possible so usually the technology is recommended for houses and top floor dwellings only. The system also requires either a dedicated hot water cylinder or a dual-cylinder. In apartments where space is at a premium and an electric combi boiler is specified, this additional equipment would take up valuable storage space.

For this project, while not unviable, other technologies are preferred to achieve higher levels of carbon reduction within a quicker payback period.

Ground Source Heat Pumps

Ground Source Heat Pumps (GSHP) differ from Air Source Heat Pumps in that they draw their heat from the ground rather than the air. This allows for both a more consistent temperature and higher efficiency given that in the winter months, the ground is warmer than the air. This allows the running costs of the system to be lower, although maintenance costs are higher.

To install a GSHP, you either need to install a ground-loop (*slinky)* system or to have deep boreholes installed during the piling phase of the scheme. The introduction of boreholes comes at significant capital cost, especially for schemes where raft or strip foundations are proposed so unless a significant amount of land is available then this can make the capital cost prohibitive.

GSHPs are more suited to very large dwellings, having a higher kW output than air source heat pumps and dwellings in a more secluded and detached location, with the external units noisier and less aesthetic than air source. **Based on the development proposals here, other technologies are preferred**.

Air Source Heat Pumps

Air Source Heat Pumps (ASHP) for domestic use are a fast-maturing technology and heat pumps are the primary policy driver for the commitment to meet net-zero by 2050. It is a renewable technology that produces circa 3 units of electricity for each unit consumed from the National Grid (300% efficiency / a coefficient of performance (COP) of 3). With the continued decarbonisation of the grid, associated carbon emissions with the system are projected to continually decrease in the near to medium term.

Domestic ASHP models have advanced in recent years, being integrated with smart technology features like app control, IoT integration and voice assistant compatibility. Noise levels have dropped to where they can be below the level where planning permission is required (permitted development) and their aesthetic has softened. They can also work at higher efficiency at lower temperatures than a decade ago, especially when paired with underfloor heating.

While efficiency at freezing temperatures is still an issue, this has been improving slowly over the past decade. Capital cost is still much higher than Gas or Electric boilers but it is hoped that economies of scale will improve the competitive in the short term.

Overall, an ASHP is the most feasible renewable technology for a standard house currently.

Hot Water Heat Pumps / Exhaust Air Heat Pumps

Hot Water Heat Pumps (HWHP) are essentially hot water cylinders integrated with a small heat pump to raise the efficiency of the system above the 1 of a standard electric cylinder. This provides domestic hot water at efficiencies above that of an ASHP (as the pump is dedicated for the Hot Water) when it comes to hot water generation.

As they do not provide any contribution towards heating, they are best suited for projects where there is both limited external space, a higher hot water than heating demand and also where a bath has been installed making them ideal for 1 or 2 bedroom apartments. They are not best suited to larger houses or dwellings with multiple bathrooms due to the size of the cylinder (litres) and the output (kW) of the heat pump.

Exhaust Air Heat Pumps (EAHP) are similar but provide heating, hot water and ventilation in a large all-internal unit. However, these are suited to Passivhaus style developments or small apartments as the units have a very low heat output (<2kW) so if not, need to be supplemented with electric panel heaters. They also have noise considerations and ease-of-maintenance is unknown as a new technology in England.

Based on the proposed scheme containing houses, neither of these technologies are suitable.

Table: Renewable Energy Feasibility

Renewable Energy Tariffs

For new-build developments within England, there are no grants available for the installation of renewable technologies. Previous schemes such as the Feed-In-Tarriff (FiT) and Renewable Heat Incentive (RHI) are now closed to new applications.

The only scheme available is the Smart Export Guarantee for PV systems, administered through utility companies where a small payment for exported energy is paid.

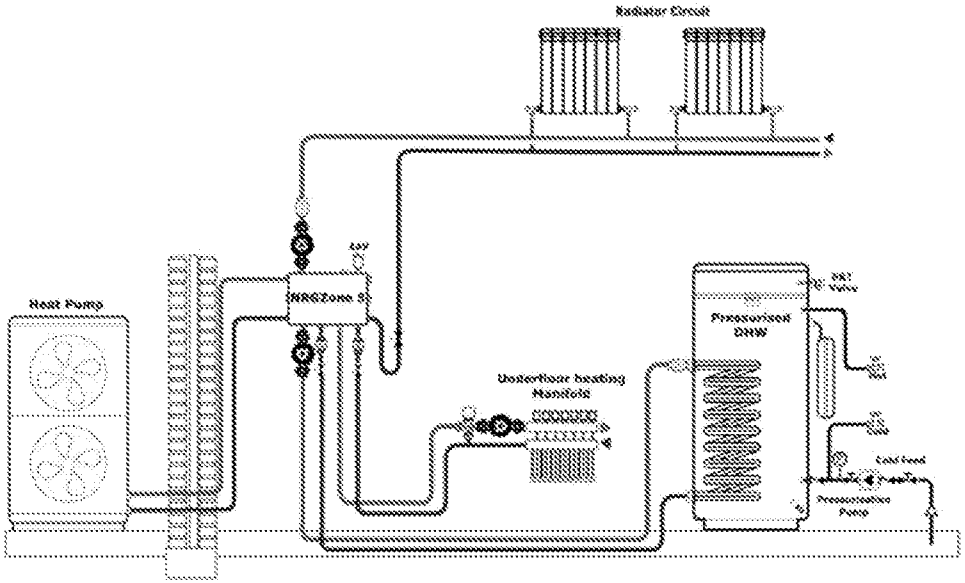
Feasibility Conclusion

Following a review of the available technologies, the following have been integrated into the scheme:

- Air Source Heat Pumps (Individual)

4.1 Air Source Heat Pumps (Individual)

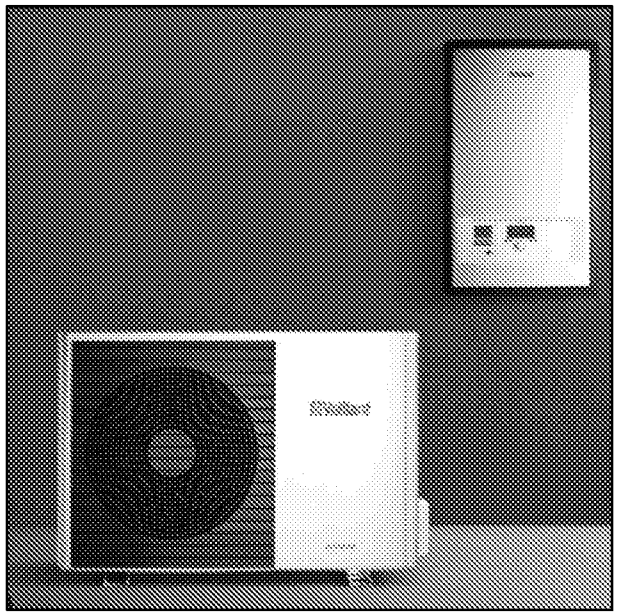
Air Source Heat Pumps (ASHPs) are designed to extract heat from the external air, a process that is effective even during colder conditions. Despite low temperatures, the air contains heat energy that can be utilised. Through a refrigerant system, ASHPs absorb this ambient heat at a lower temperature, use a compressor to increase its temperature, and subsequently transfer the elevated heat via a heat exchanger into the building's heating system. The functionality of ASHPs is based on refrigerant, which easily transitions between liquid and gaseous states. During the evaporation process, the refrigerant absorbs heat; when it is compressed and condensed back into a liquid, it releases heat.



Scheme Proposals

At this early stage, an indicative Air Source Heat Pump has been modelled for the purpose of Part L compliance based on the estimated kW output and by using a common manufacturer that performs averagely in SAP. This is due to using a SAP default ASHP causes a disproportionately poor result within the software that would not be reflective of the final scheme.

A final make & model will be supplied during M&E design at RIBA Stage 3 / 4.



ASHP System Details	
Number of Heat Pumps	9 (1 per property)
Size of Heat Pumps	Circa 7 kW
Provides	Space Heating and Hot Water
Make and Model	Vaillant aroTHERM plus (for SAP modelling purposes)
SCOP	TBC depending on model but in excess of 3 (300%)
External Unit Location	Rear Garden

Table: Proposed ASHP Specification

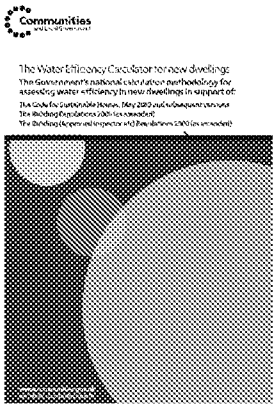
5 Water Efficiency

The Local Plan requires that all developments must incorporate water conservation to ensure a maximum internal water consumption rate of 110 litres/per person/per day (with an additional external water allowance of 5 litres).

This target is the same as the optional target included within Part G of the Building Regulations which encourages the efficient use of potable water. The specification proposed has been produced using the calculation methodology used to assess compliance against the water performance targets in Building Regulations 17.K and is based on the Government's *"The Water Efficiency Calculator for new dwellings – September 2009"* (withdrawn in June 2016).

The current guidance and calculation methodology can now be found within *Approved Document G - Sanitation, hot water safety and water efficiency* (2015 edition with 2016 amendments):
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/504207/BR_PDF_AD_G_2015_with_2016_amendments.pdf

The proposed specification for the scheme can be found on the right-hand side of the page. For the Dishwashers and Washing Machines, default consumption figures have been used.



Proposed Sanitaryware Specification		
Element	**Specification**	**Unit of Measurement**
WC	***6/3 dual flush***	*Litres per Flush*
Basin Taps	***5***	*Litres per Minute*
Kitchen Sink Taps	***9***	*Litres per Minute*
Shower	***8***	*Litres per Minute*
Bath	***155***	*Capacity to Overflow*
Washing Machine	***8.17***	*Litres per Kilo (Dry)*
Dishwasher	***1.25***	*Litres per Place Setting*
Allowance for External Use	**5**	*(Litres / Person / Day)*
Total Consumption (Litres / Person / Day)		**109.7**

Table: Proposed Water Consumption (litres/person/day)

6 Conclusion

An energy assessment has been undertaken on the proposed scheme in-line with the requirements of the Local Authority. These calculations illustrate a reduction in CO_2 emissions over the baseline of Part L via:

Energy Efficiency Measures

- Thermal insulation specified to achieve U-Values lower than the Part L 2021 notional.
- An Air Permeability target of 3 $m^3/(hm^2)$ @50Pa
- LED Lighting with high luminous efficacy (85lm/W) will be provided to all fittings.

Renewable Technologies

A feasibility on renewable technologies has been undertaken and the following systems are proposed for the scheme:

- An Air Source Heat Pump will be provided to each dwelling.

As per the CO_2 emissions shown on this page, the proposed scheme is a highly-sustainable and low-carbon development that complies with and exceeds the 10% CO_2 reduction by renewable energy requirement of the Local Authority.

	CO_2 Emissions (Tonnes per Annum)
	Residential
Baseline: Part L 2021 of the Building Regulation (TER)	**13.5**
CO_2 Emissions Pre-Renewable Energy	**11.5**
Final CO_2 Emissions of Proposed Development (DER)	**5.7**
CO_2 Savings over Part L 2021	**57.8%**
CO_2 Savings by Renewable Energy	**50%**

Table: Carbon Emissions Table

Appendix 1

Project Eastmere Stables

Plots	Floor Area m^2	Target Emissions (TER) Part L Baseline $kg/CO_2/m^2/year$	Total TER $kg/CO_2/year$	Dwelling Emission Rate (DER) - Pre-Renewable Energy $kg/CO_2/m^2/year$	Total DER Part L 2021 - Pre-Renewable Energy $kg/CO_2/year$	Final Dwelling Emission Rate (DER) $kg/CO_2/m^2/year$	Final DER Part L 2021 $kg/CO_2/year$
1	129.62	9.94	1,288	7.90	1,024	4.12	534
2	151.81	8.80	1,336	8.87	1,347	4.33	657
3	151.81	9.57	1,453	9.45	1,435	4.56	692
4	171.93	8.86	1,523	7.21	1,240	3.62	622
5	171.93	9.66	1,661	7.78	1,338	3.86	664
6	192.2	8.55	1,643	7.04	1,353	3.47	667
7	192.2	8.70	1,672	7.15	1,374	3.51	675
8	171.93	9.66	1,661	7.78	1,338	3.86	664
9	129.62	9.99	1,295	7.93	1,028	4.14	537
Total Site Area (m^2):	1,463		13,533		11,475		5,714

Baseline			Overall Results - Part L 2021		
Baseline Emissions (TER) - Total Site	13,533	$kg/CO_2/year$	Final CO_2 Emissions	5,714	$kg/CO_2/year$
Unregulated Energy - Total Site	1,269	$kg/CO_2/year$	CO_2 Savings over Part L 2021	57.79	%

Renewable Energy			Overall Results - Carbon Savings		
CO_2 Emissions Pre-Renewable Energy	11,475	$kg/CO_2/year$	Total CO_2 savings via Renewable Energy	5,764	$kg/CO_2/year$
Final CO_2 Emissions	5,711	$kg/CO_2/year$	Total CO_2 savings over Part L 2021	7,821	$kg/CO_2/year$
CO_2 Savings via Renewable Energy	50.23	%			

Appendix 2

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 1	Assessment Date	27/09/2024
Property Address	Pre renewable	Date of Test	
Address	Plot 1 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

DER Rating	64 D	TER	7.90	TFA	9.94
Environmental	92 A	% DER < TER			20.52
Ov. Heat Loss (kWh/m2/yr)	0.86	DPER	35.89	TFA	40.41
Primary Energy	See BREL	% DPER < TER			11.19
% Heat & Power	-57.91	DFEE	81.97	TFA	51.91

Assessor Name	Mr. Neil Rothon	Accreditation	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.8100	(1b)	x 2.4000	(2b) =	155.5440	(1b) - (3b)
First floor	64.8100	(1c)	x 2.6000	(2c) =	168.5060	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	129.6200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		324.0500	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1234	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2734	(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) =	0.2529	(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	0.3225	0.3162	0.3098	0.2782	0.2719	0.2403	0.2403	0.2340	0.2529	0.2719	0.2845	0.2972	(22b)
Effective ac	0.5520	0.5500	0.5480	0.5387	0.5370	0.5289	0.5289	0.5274	0.5320	0.5370	0.5405	0.5442	(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	
Front door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			24.6600	1.1450	28.2366			(27)
rl			0.7200	1.2357	0.8897			(27a)
rl			0.7200	1.2357	0.8897			(27a)
Heatloss Floor 1			64.8100	0.1000	6.4810	75.0000	4860.7500	(28a)
External Wall 1	146.8200	22.4100	124.4100	0.1500	18.6615	110.0000	13685.1000	(29a)
dormers	6.8000	4.2000	2.6000	0.1800	0.4680	9.0000	23.4000	(29a)
External Roof 1	56.1500		56.1500	0.1200	6.7380	9.0000	505.3500	(30)
sloping	19.8100	1.4400	18.3700	0.1600	2.9392	9.0000	165.3300	(30)
Total net area of external elements Aum(A, m2)			294.3900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		67.6438			(33)
Internal Wall 1			215.8000			9.0000	1942.2000	(32c)
Internal Floor 1			64.8100			18.0000	1166.5800	(32d)
Internal Ceiling 1			64.8100			9.0000	583.2900	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		22932.0000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							176.9171	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	34.2600	0.0590	2.0213	
E16 Corner (normal)	17.0000	0.0350	0.5950	
E17 Corner (inverted - internal area greater than external area)	3.4200	-0.0660	-0.2257	
E13 Gable (insulation at rafter level)	7.2000	0.0420	0.3024	
E11 Eaves (insulation at rafter level)	13.7600	0.0220	0.3027	
E12 Gable (insulation at ceiling level)	12.4000	0.0410	0.5084	
E6 Intermediate floor within a dwelling	34.2600	0.0010	0.0343	
E16 Corner (normal)	7.5600	0.1800	1.3608	
R4 Ridge (vaulted ceiling)	2.7000	0.1200	0.3240	
R9 Roof to wall (flat ceiling)	9.0000	0.3200	2.8800	
R7 Flat ceiling (inverted)	5.4000	0.1200	0.6480	
E3 Sill	18.5900	0.0000	0.0000	
R11 Upstands or kerbs of rooflights	6.8000	0.2400	1.6320	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.3832 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 78.0270 (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	59.0288	58.8129	58.6012	57.6071	57.4211	56.5553	56.5553	56.3950	56.8888	57.4211	57.7974	58.1908	(38)
Heat transfer coeff	137.0558	136.8399	136.6282	135.6341	135.4481	134.5823	134.5823	134.4220	134.9158	135.4481	135.8244	136.2178	(39)
Average = Sum(39)m / 12 =												135.6332	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0574	1.0557	1.0541	1.0464	1.0450	1.0383	1.0383	1.0370	1.0409	1.0450	1.0479	1.0509	(40)
HLP (average)												1.0464	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8940 (42)
Hot water usage for mixer showers

72.7427	71.6495	70.0565	67.0086	64.7594	62.2510	60.8253	62.4062	64.1392	66.8324	69.9457	72.4640	(42a)

Hot water usage for baths

31.4049	30.9385	30.2817	29.0707	28.1639	27.1584	26.6153	27.2675	27.9776	29.0536	30.2895	31.2988	(42b)

Hot water usage for other uses

44.2674	42.6577	41.0480	39.4383	37.8285	36.2188	36.2188	37.8285	39.4383	41.0480	42.6577	44.2674	(42c)

Average daily hot water use (litres/day) 136.4268 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.4151	145.2457	141.3862	135.5176	130.7518	125.6283	123.6594	127.5023	131.5551	136.9339	142.8930	148.0302	(44)
Energy conte	235.0532	206.8280	217.3054	185.5168	176.0171	154.4746	149.5553	157.8744	162.2206	185.8181	203.5772	231.7795	(45)
Energy content (annual)										Total = Sum(45)m =		2266.0203	
Distribution loss (46)m = 0.15 x (45)m	35.2580	31.0242	32.5958	27.8275	26.4026	23.1712	22.4333	23.6812	24.3331	27.8727	30.5366	34.7669	(46)

Water storage loss:
Store volume 250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 1.0800 (55)
Total storage loss

33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)

If cylinder contains dedicated solar storage

33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

268.5332	237.0680	250.7854	217.9168	209.4971	186.8746	183.0353	191.3544	194.6206	219.2981	235.9772	265.2595	(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

268.5332	237.0680	250.7854	217.9168	209.4971	186.8746	183.0353	191.3544	194.6206	219.2981	235.9772	265.2595	(64)
									Total per year (kWh/year) = Sum(64)m =		2660.2203	(64)
12Total per year (kWh/year)											2660	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)

Heat gains from water heating, kWh/month

104.9392	92.9623	99.0380	87.6044	85.3097	77.2828	76.5111	79.2772	79.8583	88.5685	93.6094	103.8507	(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	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	150.7234	166.8723	150.7234	155.7475	150.7234	155.7475	150.7234	150.7234	155.7475	150.7234	155.7475	150.7234	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.2620	300.3466	292.5734	276.0251	255.1359	235.5030	222.3871	219.3024	227.0756	243.6239	264.5131	284.1460	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	(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)	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	(71)
Water heating gains (Table 5)	141.0473	138.3368	133.1156	121.6727	114.6636	107.3372	102.8376	106.5554	110.9144	119.0437	130.0131	139.5842	(72)
Total internal gains	655.4426	671.9657	642.8224	619.8553	586.9328	564.9977	542.3580	542.9912	560.1475	579.8009	616.6836	640.8636	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	1.4400	26.0000	0.4000	0.7000	1.0000	9.4349	(82)
North	1.0100	10.6334	0.7200	0.7000	0.7700	3.7511	(74)

East			8.8100		19.6403		0.7200		0.7000		0.7700	60.4348	(76)
South			0.5600		46.7521		0.7200		0.7000		0.7700	9.1443	(78)
West			14.2800		19.6403		0.7200		0.7000		0.7700	97.9579	(80)
Solar gains	180.7230	351.5897	576.3726	839.7692	1030.5556	1056.0677	1004.9299	861.9201	669.7795	416.2991	224.9387	148.9035	(83)
Total gains	836.1656	1023.5554	1219.1950	1459.6245	1617.4885	1621.0654	1547.2879	1404.9113	1229.9269	996.1000	841.6223	789.7671	(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	46.4774	46.5508	46.6229	46.9646	47.0291	47.3316	47.3316	47.3881	47.2146	47.0291	46.8988	46.7634	
alpha	4.0985	4.1034	4.1082	4.1310	4.1353	4.1554	4.1554	4.1592	4.1476	4.1353	4.1266	4.1176	
util living area	0.9897	0.9765	0.9429	0.8492	0.6941	0.5126	0.3783	0.4319	0.6808	0.9159	0.9799	0.9918	(86)
MIT	19.3930	19.6758	20.0848	20.5571	20.8488	20.9665	20.9925	20.9872	20.8967	20.4526	19.8281	19.3421	(87)
Th 2	20.0358	20.0372	20.0385	20.0448	20.0460	20.0516	20.0516	20.0526	20.0494	20.0460	20.0436	20.0411	(88)
util rest of house	0.9873	0.9712	0.9302	0.8189	0.6420	0.4432	0.2988	0.3466	0.6092	0.8913	0.9745	0.9898	(89)
MIT 2	18.1574	18.5163	19.0278	19.5973	19.9158	20.0301	20.0484	20.0468	19.9737	19.4917	18.7171	18.0962	(90)
Living area fraction										fLA = Living area / (4) =		0.2119	(91)
MIT	18.4193	18.7621	19.2518	19.8007	20.1136	20.2285	20.2485	20.2461	20.1693	19.6954	18.9525	18.3603	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4193	18.7621	19.2518	19.8007	20.1136	20.2285	20.2485	20.2461	20.1693	19.6954	18.9525	18.3603	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9815	0.9617	0.9174	0.8102	0.6459	0.4565	0.3155	0.3643	0.6188	0.8803	0.9659	0.9849	(94)
Useful gains	820.7106	984.3916	1118.4901	1182.6550	1044.7771	740.0606	488.1731	511.8638	761.0978	876.8673	812.9543	777.8418	(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	1935.1261	1896.8812	1742.2613	1478.5131	1139.6022	757.4999	491.0249	517.0040	818.8472	1231.9488	1609.8597	1928.8798	(97)
Space heating kWh	829.1252	613.1930	464.0858	213.0178	70.5498	0.0000	0.0000	0.0000	0.0000	264.1806	573.7719	856.3722	(98a)
Space heating requirement - total per year (kWh/year)												3884.2964	
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	829.1252	613.1930	464.0858	213.0178	70.5498	0.0000	0.0000	0.0000	0.0000	264.1806	573.7719	856.3722	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3884.2964	
Space heating per m2											(98c) / (4) =	29.9668	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	829.1252	613.1930	464.0858	213.0178	70.5498	0.0000	0.0000	0.0000	0.0000	264.1806	573.7719	856.3722	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	829.1252	613.1930	464.0858	213.0178	70.5498	0.0000	0.0000	0.0000	0.0000	264.1806	573.7719	856.3722	(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	268.5332	237.0680	250.7854	217.9168	209.4971	186.8746	183.0353	191.3544	194.6206	219.2981	235.9772	265.2595	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month	268.5332	237.0680	250.7854	217.9168	209.4971	186.8746	183.0353	191.3544	194.6206	219.2981	235.9772	265.2595	(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	36.1792	29.0243	26.1331	19.1463	14.7891	12.0828	13.4911	17.5363	22.7779	29.8858	33.7560	37.1847	(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												3884.2964	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												2660.2203	(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)	291.9865	(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	6836.5033	(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	3884.2964	0.1561	606.1943	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2660.2203	0.1412	375.4994	(264)
Space and water heating			981.6937	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	291.9865	0.1443	42.1427	(268)
Total CO2, kg/year			1023.8364	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.9000	(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	3884.2964	1.5778	6128.4718	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2660.2203	1.5219	4048.7142	(278)
Space and water heating			10177.1860	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	291.9865	1.5338	447.8587	(282)
Total Primary energy kWh/year			10625.0447	(286)
Dwelling Primary energy Rate (DPER)			81.9700	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.8100 (1b)	x	2.4000 (2b)	=	155.5440	(1b) - (3b)
First floor	64.8100 (1c)	x	2.6000 (2c)	=	168.5060	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 129.6200						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	324.0500	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1234	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3734	(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) =	0.3454	(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	0.4404	0.4318	0.4232	0.3800	0.3713	0.3282	0.3282	0.3195	0.3454	0.3713	0.3886	0.4059	(22b)
Effective ac	0.5970	0.5932	0.5895	0.5722	0.5689	0.5538	0.5538	0.5510	0.5597	0.5689	0.5755	0.5824	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.9500	1.0000	1.9500			(26)
TER Opening Type (Uw = 1.20)			24.6600	1.1450	28.2366			(27)
rl			0.7200	2.0221	1.4559			(27a)
rl			0.7200	2.0221	1.4559			(27a)
Heatloss Floor 1			64.8100	0.1300	8.4253			(28a)
External Wall 1	146.8200	22.4100	124.4100	0.1800	22.3938			(29a)
dormers	6.8000	4.2000	2.6000	0.1800	0.4680			(29a)
External Roof 1	56.1500		56.1500	0.1100	6.1765			(30)
sloping	19.8100	1.4400	18.3700	0.1100	2.0207			(30)
Total net area of external elements Aum(A, m2)			294.3900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		72.5827			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 176.9171 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.2600	0.1600	5.4816
E16 Corner (normal)	17.0000	0.0900	1.5300
E17 Corner (inverted - internal area greater than external area)	3.4200	-0.0900	-0.3078
E13 Gable (insulation at rafter level)	7.2000	0.0800	0.5760
E11 Eaves (insulation at rafter level)	13.7600	0.0400	0.5504
E12 Gable (insulation at ceiling level)	12.4000	0.0600	0.7440
E6 Intermediate floor within a dwelling	34.2600	0.0000	0.0000
E16 Corner (normal)	7.5600	0.0900	0.6804
R4 Ridge (vaulted ceiling)	2.7000	0.0800	0.2160
R9 Roof to wall (flat ceiling)	9.0000	0.0400	0.3600
R7 Flat ceiling (inverted)	5.4000	0.0400	0.2160
E3 Sill	18.5900	0.0500	0.9295
R11 Upstands or kerbs of rooflights	6.8000	0.0800	0.5440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.5201 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 84.1028 (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	63.8396	63.4369	63.0421	61.1880	60.8411	59.2261	59.2261	58.9271	59.8482	60.8411	61.5428	62.2765	(38)
Heat transfer coeff	147.9424	147.5397	147.1449	145.2908	144.9439	143.3289	143.3289	143.0299	143.9510	144.9439	145.6457	146.3793	(39)
Average = Sum(39)m / 12 =												145.2891	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1414	1.1382	1.1352	1.1209	1.1182	1.1058	1.1058	1.1035	1.1106	1.1182	1.1236	1.1293	(40)
HLP (average)												1.1209	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8940 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.7427	71.6495	70.0565	67.0086	64.7594	62.2510	60.8253	62.4062	64.1392	66.8324	69.9457	72.4640	(42a)
Hot water usage for baths	31.4049	30.9385	30.2817	29.0707	28.1639	27.1584	26.6153	27.2675	27.9776	29.0536	30.2895	31.2988	(42b)
Hot water usage for other uses	44.2674	42.6577	41.0480	39.4383	37.8285	36.2188	36.2188	37.8285	39.4383	41.0480	42.6577	44.2674	(42c)
Average daily hot water use (litres/day)												136.4268	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.4151	145.2457	141.3862	135.5176	130.7518	125.6283	123.6594	127.5023	131.5551	136.9339	142.8930	148.0302	(44)
Energy conte	235.0532	206.8280	217.3054	185.5168	176.0171	154.4746	149.5553	157.8744	162.2206	185.8181	203.5772	231.7795	(45)
Energy content (annual)										Total = Sum(45)m =		2266.0203	
Distribution loss (46)m = 0.15 x (45)m	35.2580	31.0242	32.5958	27.8275	26.4026	23.1712	22.4333	23.6812	24.3331	27.8727	30.5366	34.7669	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0208	(55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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	289.9600	256.4212	272.2122	238.6525	230.9239	207.6102	204.4621	212.7812	215.3562	240.7249	256.7128	286.6863	(62)
WWHRS	-33.2549	-29.4109	-30.7974	-25.5015	-23.7665	-20.3371	-19.0628	-20.2714	-21.0416	-24.8057	-28.1018	-32.6391	(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	256.7051	227.0103	241.4148	213.1510	207.1574	187.2731	185.3993	192.5098	194.3146	215.9192	228.6110	254.0472	(64)
									Total per year (kWh/year) = Sum(64)m =			2603.5127	(64)
12Total per year (kWh/year)												2604	(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	122.0806	108.4449	116.1795	104.1928	102.4511	93.8713	93.6526	96.4187	96.4468	105.7099	110.1979	120.9921	(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	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	150.7234	166.8723	150.7234	155.7475	150.7234	155.7475	150.7234	150.7234	155.7475	150.7234	155.7475	150.7234	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.2620	300.3466	292.5734	276.0251	255.1359	235.5030	222.3871	219.3024	227.0756	243.6239	264.5131	284.1460	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	(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)	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	(71)
Water heating gains (Table 5)	164.0868	161.3763	156.1552	144.7123	137.7031	130.3768	125.8771	129.5950	133.9539	142.0833	153.0527	162.6238	(72)
Total internal gains	681.4822	698.0052	668.8620	645.8949	612.9724	588.0373	565.3975	566.0307	583.1870	605.8405	642.7232	666.9031	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.0100	10.6334	0.6300	0.7000	0.7700	3.2822	(74)
East	8.8100	19.6403	0.6300	0.7000	0.7700	52.8804	(76)
South	0.5600	46.7521	0.6300	0.7000	0.7700	8.0013	(78)
West	14.2800	19.6403	0.6300	0.7000	0.7700	85.7131	(80)
East	1.4400	26.0000	0.6300	0.7000	1.0000	14.8599	(82)

Solar gains	164.7370	321.3579	528.7116	772.9005	950.5072	974.8624	927.3227	794.0606	615.2689	381.0267	205.2039	135.6249	(83)
Total gains	846.2192	1019.3631	1197.5735	1418.7954	1563.4796	1562.8997	1492.7202	1360.0914	1198.4559	986.8672	847.9271	802.5281	(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	43.0573	43.1748	43.2907	43.8431	43.9480	44.4432	44.4432	44.5361	44.2512	43.9480	43.7363	43.5171	
alpha	3.8705	3.8783	3.8860	3.9229	3.9299	3.9629	3.9629	3.9691	3.9501	3.9299	3.9158	3.9011	
util living area	0.9895	0.9782	0.9506	0.8723	0.7342	0.5553	0.4143	0.4694	0.7171	0.9254	0.9805	0.9914	(86)
MIT	19.2397	19.5134	19.9258	20.4365	20.7832	20.9463	20.9868	20.9787	20.8547	20.3561	19.7087	19.2019	(87)
Th 2	19.9672	19.9697	19.9722	19.9838	19.9860	19.9961	19.9961	19.9980	19.9922	19.9860	19.9816	19.9770	(88)
util rest of house	0.9871	0.9731	0.9390	0.8440	0.6813	0.4790	0.3235	0.3734	0.6433	0.9021	0.9750	0.9894	(89)
MIT 2	17.9168	18.2654	18.7840	19.4099	19.7972	19.9615	19.9907	19.9885	19.8846	19.3322	18.5242	17.8751	(90)
Living area fraction									fLA = Living area / (4) =			0.2119	(91)
MIT	18.1972	18.5299	19.0260	19.6275	20.0062	20.1702	20.2018	20.1984	20.0902	19.5492	18.7752	18.1563	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1972	18.5299	19.0260	19.6275	20.0062	20.1702	20.2018	20.1984	20.0902	19.5492	18.7752	18.1563	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9808	0.9633	0.9254	0.8325	0.6825	0.4927	0.3425	0.3931	0.6511	0.8896	0.9660	0.9840	(94)
Useful gains	829.9732	981.9558	1108.1751	1181.1463	1067.0404	770.1034	511.1926	534.6439	780.3350	877.9470	819.1146	789.6693	(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	2055.9793	2010.9478	1843.1313	1558.6041	1203.9299	798.3765	516.2439	543.2794	862.2971	1297.1257	1700.4415	2042.9182	(97)
Space heating kWh	912.1485	691.4826	546.8074	271.7696	101.8458	0.0000	0.0000	0.0000	0.0000	311.8690	634.5554	932.4172	(98a)
Space heating requirement - total per year (kWh/year)												4402.8955	
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	912.1485	691.4826	546.8074	271.7696	101.8458	0.0000	0.0000	0.0000	0.0000	311.8690	634.5554	932.4172	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4402.8955	
Space heating per m2											(98c) / (4) =	33.9677	(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	912.1485	691.4826	546.8074	271.7696	101.8458	0.0000	0.0000	0.0000	0.0000	311.8690	634.5554	932.4172	(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)	988.2433	749.1686	592.4241	294.4416	110.3421	0.0000	0.0000	0.0000	0.0000	337.8862	687.4923	1010.2028	(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	256.7051	227.0103	241.4148	213.1510	207.1574	187.2731	185.3993	192.5098	194.3146	215.9192	228.6110	254.0472	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.6536	86.3919	85.8350	84.6057	82.5578	79.8000	79.8000	79.8000	79.8000	84.8835	86.2244	86.7061	(217)
Fuel for water heating, kWh/month	296.2426	262.7682	281.2543	251.9344	250.9240	234.6781	232.3300	241.2404	243.5020	254.3711	265.1348	292.9980	(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	31.3173	25.1239	22.6213	16.5733	12.8017	10.4591	11.6782	15.1797	19.7170	25.8697	29.2198	32.1877	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-57.5203	-79.5506	-112.1751	-123.6082	-131.1357	-121.5427	-119.9211	-114.1745	-103.8402	-89.6424	-62.6369	-49.9023	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-37.3743	-78.0054	-153.9601	-229.7378	-302.4007	-303.4380	-299.9756	-254.7098	-187.5834	-111.1829	-49.7667	-29.6118 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4770.2010	(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	3107.3779	(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)	252.7489	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3203.3966	(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	5012.9311	(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	4770.2010	0.2100	1001.7422	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3107.3779	0.2100	652.5494	(264)
Space and water heating			1654.2916	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	252.7489	0.1443	36.4795	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1165.6501	0.1350	-157.3886	
PV Unit electricity exported	-2037.7465	0.1261	-256.9207	
Total			-414.3093	(269)
Total CO2, kg/year			1288.3910	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9400	(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	4770.2010	1.1300	5390.3271	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3107.3779	1.1300	3511.3370	(278)
Space and water heating			8901.6641	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	252.7489	1.5338	387.6746	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1165.6501	1.4990	-1747.3602	
PV Unit electricity exported	-2037.7465	0.4628	-943.0914	
Total			-2690.4516	(283)
Total Primary energy kWh/year			6728.9879	(286)
Target Primary Energy Rate (TPER)			51.9100	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 2	Assessment Date	27/09/2024
Property Address	Pre renewable	Prop Type Name	
Address	Plot 2 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

EI Rating	57 D	DER	8.87	TER	8.80
Environment	91 B	% DER < TER			-0.80
CO2 Emissions (t/year)	1.12	DFEE	43.41	TFEE	51.67
Compliance Check	See BREL	% DFEE > TFEE			15.98
Assessor's Name	-87.90	DPER	91.69	TPER	48.80

Assessor Name	Mr. Neil Rothon	Accreditation	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	151.8100	(1b)	x 2.7900	(2b) =	423.5499	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	151.8100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		423.5499	(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	5 * 10 =	50.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) =	0.1180	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2680	(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) =	0.2278	(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	0.2905	0.2848	0.2791	0.2506	0.2449	0.2165	0.2165	0.2108	0.2278	0.2449	0.2563	0.2677	(22b)
Effective ac	0.5422	0.5406	0.5390	0.5314	0.5300	0.5234	0.5234	0.5222	0.5260	0.5300	0.5329	0.5358	(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	
Front door			1.9500	1.2000	2.3400			(26)
side door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			26.1300	1.1450	29.9198			(27)
Heatloss Floor 1			151.8100	0.1000	15.1810	75.0000	11385.7500	(28a)
External Wall 1	184.4700	30.0300	154.4400	0.1500	23.1660	110.0000	16988.4000	(29a)
External Roof 1	110.2100		110.2100	0.1200	13.2252	9.0000	991.8900	(30)
sloping	48.8300		48.8300	0.1600	7.8128	9.0000	439.4700	(30)
Total net area of external elements Aum(A, m2)			495.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		93.9848			(33)
Internal Wall 1			192.7600			9.0000	1734.8400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	31540.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		207.7620 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	21.0400	0.0310	0.6522
E3 Sill	12.6800	0.0290	0.3677
E4 Jamb	49.2200	0.0240	1.1813
E5 Ground floor (normal)	69.9800	0.0590	4.1288
E16 Corner (normal)	24.0000	0.0350	0.8400

E17 Corner (inverted - internal area greater than external area)	14.4000	-0.0660	-0.9504	
E13 Gable (insulation at rafter level)	16.4000	0.0420	0.6888	
E11 Eaves (insulation at rafter level)	8.1600	0.0220	0.1795	
R4 Ridge (vaulted ceiling)	7.2000	0.1200	0.8640	
E12 Gable (insulation at ceiling level)	11.6200	0.0410	0.4764	
E10 Eaves (insulation at ceiling level)	37.7800	0.0640	2.4179	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				10.8463 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	104.8312 (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	75.7834	75.5544	75.3299	74.2755	74.0782	73.1599	73.1599	72.9899	73.5137	74.0782	74.4773	74.8945	(38)
Heat transfer coeff	180.6145	180.3855	180.1610	179.1067	178.9094	177.9911	177.9911	177.8210	178.3448	178.9094	179.3085	179.7257	(39)
Average = Sum(39)m / 12 =												179.1057	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1897	1.1882	1.1868	1.1798	1.1785	1.1725	1.1725	1.1713	1.1748	1.1785	1.1811	1.1839	(40)
HLP (average)												1.1798	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9370	(42)
Hot water usage for mixer showers	73.4633	72.3593	70.7505	67.6725	65.4009	62.8677	61.4278	63.0244	64.7746	67.4945	70.6387	73.1818	(42a)
Hot water usage for baths	31.7148	31.2438	30.5806	29.3576	28.4418	27.4264	26.8779	27.5366	28.2537	29.3403	30.5884	31.6076	(42b)
Hot water usage for other uses	44.7076	43.0819	41.4561	39.8304	38.2047	36.5789	36.5789	38.2047	39.8304	41.4561	43.0819	44.7076	(42c)
Average daily hot water use (litres/day)												137.7786	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.8857	146.6850	142.7872	136.8604	132.0474	126.8731	124.8847	128.7657	132.8587	138.2908	144.3089	149.4970	(44)
Energy conte	237.3824	208.8774	219.4586	187.3551	177.7612	156.0052	151.0372	159.4388	163.8281	187.6594	205.5945	234.0762	(45)
Energy content (annual)										Total = Sum(45)m =		2288.4742	
Distribution loss (46)m = 0.15 x (45)m	35.6074	31.3316	32.9188	28.1033	26.6642	23.4008	22.6556	23.9158	24.5742	28.1489	30.8392	35.1114	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.0800	(55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	270.8624	239.1174	252.9386	219.7551	211.2412	188.4052	184.5172	192.9188	196.2281	221.1394	237.9945	267.5562	(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	270.8624	239.1174	252.9386	219.7551	211.2412	188.4052	184.5172	192.9188	196.2281	221.1394	237.9945	267.5562	(64)
										Total per year (kWh/year) = Sum(64)m =		2682.6742	(64)
12Total per year (kWh/year)												2683	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	105.7136	93.6438	99.7540	88.2156	85.8896	77.7917	77.0039	79.7974	80.3928	89.1807	94.2802	104.6143	(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	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	167.3868	185.3210	167.3868	172.9663	167.3868	172.9663	167.3868	167.3868	172.9663	167.3868	172.9663	167.3868	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.4845	325.8309	317.3981	299.4457	276.7841	255.4853	241.2565	237.9101	246.3429	264.2952	286.9569	308.2556	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	(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)	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	(71)
Water heating gains (Table 5)	142.0882	139.3508	134.0779	122.5216	115.4430	108.0441	103.4998	107.2546	111.6567	119.8666	130.9447	140.6107	(72)
Total internal gains	699.0141	717.5574	685.9174	661.9883	626.6685	603.5504	579.1977	579.6061	598.0205	618.6032	657.9225	683.3077	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	0.3600	10.6334	0.7200	0.7000	0.7700	1.3370	(74)
East	8.7500	19.6403	0.7200	0.7000	0.7700	60.0232	(76)
South	9.3700	46.7521	0.7200	0.7000	0.7700	153.0045	(78)
West	7.6500	19.6403	0.7200	0.7000	0.7700	52.4774	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	266.8421	473.2121	685.9710	896.3217	1033.1326	1034.9851	994.2148	893.0446	760.1829	534.4553	323.2869	225.8396	(83)
Total gains	965.8562	1190.7695	1371.8884	1558.3100	1659.8011	1638.5355	1573.4125	1472.6507	1358.2034	1153.0585	981.2095	909.1473	(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	48.5078	48.5694	48.6299	48.9161	48.9701	49.2227	49.2227	49.2698	49.1251	48.9701	48.8611	48.7477	
alpha	4.2339	4.2380	4.2420	4.2611	4.2647	4.2815	4.2815	4.2847	4.2750	4.2647	4.2574	4.2498	
util living area													
	0.9945	0.9864	0.9680	0.9163	0.8110	0.6429	0.4848	0.5346	0.7684	0.9463	0.9885	0.9957	(86)
MIT	19.3385	19.6016	19.9613	20.4013	20.7426	20.9304	20.9835	20.9751	20.8485	20.3766	19.7673	19.2892	(87)
Th 2	19.9282	19.9294	19.9306	19.9362	19.9372	19.9421	19.9421	19.9430	19.9402	19.9372	19.9351	19.9329	(88)
util rest of house													
	0.9930	0.9826	0.9589	0.8924	0.7590	0.5552	0.3744	0.4213	0.6906	0.9257	0.9846	0.9945	(89)
MIT 2	17.9954	18.3307	18.7848	19.3271	19.7149	19.8993	19.9361	19.9330	19.8324	19.3103	18.5477	17.9357	(90)
Living area fraction										fLA = Living area / (4) =		0.3844	(91)
MIT	18.5118	18.8193	19.2371	19.7401	20.1100	20.2957	20.3387	20.3336	20.2230	19.7202	19.0166	18.4560	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5118	18.8193	19.2371	19.7401	20.1100	20.2957	20.3387	20.3336	20.2230	19.7202	19.0166	18.4560	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9900	0.9773	0.9514	0.8872	0.7683	0.5859	0.4167	0.4645	0.7133	0.9205	0.9800	0.9921	(94)
Useful gains	956.1891	1163.7075	1305.1580	1382.4930	1275.2693	960.0396	655.7137	684.0584	968.7963	1061.3785	961.5691	901.9383	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	2566.8502	2510.8371	2294.7213	1941.5254	1504.6289	1013.7776	665.4612	699.4826	1092.0101	1631.6852	2136.7406	2562.1721	(97)
Space heating kWh	1198.3318	905.2711	736.2351	402.5033	170.6436	0.0000	0.0000	0.0000	0.0000	424.3082	846.1235	1235.2140	(98a)
Space heating requirement - total per year (kWh/year)												5918.6306	
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	1198.3318	905.2711	736.2351	402.5033	170.6436	0.0000	0.0000	0.0000	0.0000	424.3082	846.1235	1235.2140	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5918.6306	
Space heating per m2											(98c) / (4) =	38.9871	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1198.3318	905.2711	736.2351	402.5033	170.6436	0.0000	0.0000	0.0000	0.0000	424.3082	846.1235	1235.2140	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	1198.3318	905.2711	736.2351	402.5033	170.6436	0.0000	0.0000	0.0000	0.0000	424.3082	846.1235	1235.2140	(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													
	270.8624	239.1174	252.9386	219.7551	211.2412	188.4052	184.5172	192.9188	196.2281	221.1394	237.9945	267.5562	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	270.8624	239.1174	252.9386	219.7551	211.2412	188.4052	184.5172	192.9188	196.2281	221.1394	237.9945	267.5562	(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	41.4974	33.2907	29.9746	21.9607	16.9631	13.8590	15.4743	20.1141	26.1262	34.2789	38.7180	42.6507	(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	5918.6306	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	100.0000	
Water heating fuel used	2682.6742	(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)	334.9076	(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	8936.2124	(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	5918.6306	0.1554	919.7088	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2682.6742	0.1412	378.6783	(264)
Space and water heating			1298.3872	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	334.9076	0.1443	48.3375	(268)
Total CO2, kg/year			1346.7247	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.8700	(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	5918.6306	1.5753	9323.5214	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2682.6742	1.5220	4082.9236	(278)
Space and water heating			13406.4450	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	334.9076	1.5338	513.6925	(282)
Total Primary energy kWh/year			13920.1374	(286)
Dwelling Primary energy Rate (DPER)			91.6900	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	151.8100	(1b)	x 2.7900	(2b) =	423.5499	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	151.8100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		423.5499	(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)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0944	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3444	(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) = 0.2928	(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	0.3733	0.3660	0.3586	0.3221	0.3147	0.2781	0.2781	0.2708	0.2928	0.3147	0.3294	0.3440	(22b)
Effective ac	0.5697	0.5670	0.5643	0.5519	0.5495	0.5387	0.5387	0.5367	0.5429	0.5495	0.5542	0.5592	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			3.9000	1.0000	3.9000			(26)
TER Opening Type (Uw = 1.20)			26.1300	1.1450	29.9198			(27)
Heatloss Floor 1			151.8100	0.1300	19.7353			(28a)
External Wall 1	184.4700	30.0300	154.4400	0.1800	27.7992			(29a)

External Roof 1	110.2100	110.2100	0.1100	12.1231		(30)
sloping	48.8300	48.8300	0.1100	5.3713		(30)
Total net area of external elements Aum(A, m2)		495.3200				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		98.8487		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 207.7620 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	21.0400	0.0500	1.0520
E3 Sill	12.6800	0.0500	0.6340
E4 Jamb	49.2200	0.0500	2.4610
E5 Ground floor (normal)	69.9800	0.1600	11.1968
E16 Corner (normal)	24.0000	0.0900	2.1600
E17 Corner (inverted - internal area greater than external area)	14.4000	-0.0900	-1.2960
E13 Gable (insulation at rafter level)	16.4000	0.0800	1.3120
E11 Eaves (insulation at rafter level)	8.1600	0.0400	0.3264
R4 Ridge (vaulted ceiling)	7.2000	0.0800	0.5760
E12 Gable (insulation at ceiling level)	11.6200	0.0600	0.6972
E10 Eaves (insulation at ceiling level)	37.7800	0.0600	2.2668

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.3862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 120.2349 (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	79.6238	79.2457	78.8750	77.1341	76.8083	75.2920	75.2920	75.0112	75.8761	76.8083	77.4673	78.1562	(38)
Heat transfer coeff	199.8588	199.4806	199.1100	197.3690	197.0433	195.5270	195.5270	195.2462	196.1110	197.0433	197.7022	198.3911	(39)
Average = Sum(39)m / 12 =												197.3675	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3165	1.3140	1.3116	1.3001	1.2980	1.2880	1.2880	1.2861	1.2918	1.2980	1.3023	1.3068	(40)
HLP (average)												1.3001	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9370 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.4633	72.3593	70.7505	67.6725	65.4009	62.8677	61.4278	63.0244	64.7746	67.4945	70.6387	73.1818	(42a)
Hot water usage for baths	31.7148	31.2438	30.5806	29.3576	28.4418	27.4264	26.8779	27.5366	28.2537	29.3403	30.5884	31.6076	(42b)
Hot water usage for other uses	44.7076	43.0819	41.4561	39.8304	38.2047	36.5789	36.5789	38.2047	39.8304	41.4561	43.0819	44.7076	(42c)
Average daily hot water use (litres/day)												137.7786	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.8857	146.6850	142.7872	136.8604	132.0474	126.8731	124.8847	128.7657	132.8587	138.2908	144.3089	149.4970	(44)
Energy conte	237.3824	208.8774	219.4586	187.3551	177.7612	156.0052	151.0372	159.4388	163.8281	187.6594	205.5945	234.0762	(45)
Energy content (annual)										Total = Sum(45)m =		2288.4742	
Distribution loss (46)m = 0.15 x (45)m	35.6074	31.3316	32.9188	28.1033	26.6642	23.4008	22.6556	23.9158	24.5742	28.1489	30.8392	35.1114	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0208	(55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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	292.2891	258.4707	274.3654	240.4907	232.6680	209.1408	205.9440	214.3456	216.9637	242.5662	258.7301	288.9830	(62)
WWHRS	-33.5844	-29.7023	-31.1025	-25.7541	-24.0019	-20.5386	-19.2517	-20.4722	-21.2500	-25.0514	-28.3802	-32.9624	(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	258.7048	228.7684	243.2629	214.7366	208.6661	188.6022	186.6924	193.8734	195.7136	217.5147	230.3499	256.0206	(64)
										Total per year (kWh/year) = Sum(64)m =		2622.9056	(64)
12Total per year (kWh/year)												2623	(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	122.8551	109.1263	116.8954	104.8041	103.0310	94.3802	94.1453	96.9388	96.9813	106.3222	110.8687	121.7558	(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	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	167.3868	185.3210	167.3868	172.9663	167.3868	172.9663	167.3868	167.3868	172.9663	167.3868	172.9663	167.3868	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.4845	325.8309	317.3981	299.4457	276.7841	255.4853	241.2565	237.9101	246.3429	264.2952	286.9569	308.2556	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	(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)	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	(71)
Water heating gains (Table 5)	165.1278	162.3904	157.1175	145.5612	138.4826	131.0836	126.5394	130.2941	134.6963	142.9061	153.9842	163.6502	(72)
Total internal gains	725.0537	743.5969	711.9570	688.0279	652.7081	626.5900	602.2373	602.6456	621.0601	644.6428	683.9621	709.3473	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	0.3600	10.6334	0.6300	0.7000	0.7700	1.1699	(74)
East	8.7500	19.6403	0.6300	0.7000	0.7700	52.5203	(76)
South	9.3700	46.7521	0.6300	0.7000	0.7700	133.8789	(78)
West	7.6500	19.6403	0.6300	0.7000	0.7700	45.9177	(80)

Solar gains	233.4869	414.0606	600.2246	784.2815	903.9910	905.6119	869.9379	781.4140	665.1600	467.6484	282.8761	197.6097 (83)
Total gains	958.5405	1157.6575	1312.1816	1472.3094	1556.6991	1532.2019	1472.1752	1384.0596	1286.2201	1112.2911	966.8381	906.9569 (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	43.8370	43.9201	44.0019	44.3900	44.4634	44.8082	44.8082	44.8726	44.6747	44.4634	44.3152	44.1613	
alpha	3.9225	3.9280	3.9335	3.9593	3.9642	3.9872	3.9872	3.9915	3.9783	3.9642	3.9543	3.9441	
util living area	0.9946	0.9883	0.9750	0.9379	0.8580	0.7117	0.5538	0.6031	0.8189	0.9574	0.9895	0.9957	(86)
MIT	19.1226	19.3712	19.7327	20.2041	20.6072	20.8725	20.9643	20.9497	20.7627	20.2220	19.5854	19.0829	(87)
Th 2	19.8279	19.8299	19.8318	19.8408	19.8424	19.8503	19.8503	19.8517	19.8472	19.8424	19.8390	19.8355	(88)
util rest of house	0.9931	0.9849	0.9673	0.9179	0.8104	0.6182	0.4229	0.4724	0.7432	0.9397	0.9859	0.9944	(89)
MIT 2	17.6541	17.9718	18.4308	19.0216	19.4947	19.7696	19.8372	19.8313	19.6735	19.0554	18.2528	17.6082	(90)
Living area fraction										fLA = Living area / (4) =		0.3844	(91)
MIT	18.2186	18.5098	18.9313	19.4762	19.9224	20.1936	20.2705	20.2612	20.0922	19.5039	18.7651	18.1751	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2186	18.5098	18.9313	19.4762	19.9224	20.1936	20.2705	20.2612	20.0922	19.5039	18.7651	18.1751	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9899	0.9795	0.9595	0.9101	0.8142	0.6484	0.4728	0.5216	0.7615	0.9329	0.9811	0.9918	(94)
Useful gains	948.8696	1133.9599	1259.0636	1339.9680	1267.4528	993.4234	696.1130	721.9829	979.4884	1037.6711	948.5445	899.4885	(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	2781.7587	2714.8825	2475.1980	2087.4189	1620.1717	1093.6975	717.6773	753.8926	1175.1332	1754.4470	2306.2179	2772.5384	(97)
Space heating kWh	1363.6695	1062.3800	904.8040	538.1646	262.4229	0.0000	0.0000	0.0000	0.0000	533.2812	977.5248	1393.5491	(98a)
Space heating requirement - total per year (kWh/year)												7035.7961	
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	1363.6695	1062.3800	904.8040	538.1646	262.4229	0.0000	0.0000	0.0000	0.0000	533.2812	977.5248	1393.5491	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7035.7961	
Space heating per m2											(98c) / (4) =	46.3461	(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	1363.6695	1062.3800	904.8040	538.1646	262.4229	0.0000	0.0000	0.0000	0.0000	533.2812	977.5248	1393.5491	(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)	1477.4317	1151.0076	980.2860	583.0603	284.3152	0.0000	0.0000	0.0000	0.0000	577.7695	1059.0735	1509.8040	(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	258.7048	228.7684	243.2629	214.7366	208.6661	188.6022	186.6924	193.8734	195.7136	217.5147	230.3499	256.0206	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2312	87.0603	86.7275	86.0326	84.5750	79.8000	79.8000	79.8000	79.8000	85.9903	86.9303	87.2724	(217)
Fuel for water heating, kWh/month	296.5737	262.7701	280.4912	249.5991	246.7232	236.3437	233.9503	242.9491	245.2552	252.9526	264.9823	293.3582	(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	34.7797	27.9015	25.1222	18.4056	14.2170	11.6154	12.9693	16.8579	21.8968	28.7298	32.4502	35.7463	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-105.7293	-133.8243	-172.8520	-173.9275	-171.8403	-154.9096	-152.7103	-151.2312	-147.3661	-141.9932	-110.5191	-93.2819	(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	-116.5504	-235.2327	-450.5392	-653.7452	-843.6691	-840.5590	-830.8497	-712.8380	-535.2604	-328.4169	-152.7736	-92.9708	(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	7622.7477	(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	3105.9487	(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)	280.6918	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-7503.5896	(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	3591.7986	(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	7622.7477	0.2100	1600.7770	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3105.9487	0.2100	652.2492	(264)
Space and water heating			2253.0262	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	280.6918	0.1443	40.5125	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1710.1847	0.1370	-234.3076	
PV Unit electricity exported	-5793.4049	0.1269	-735.4043	
Total			-969.7119	(269)
Total CO2, kg/year			1335.7561	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.8000	(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	7622.7477	1.1300	8613.7049	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3105.9487	1.1300	3509.7220	(278)
Space and water heating			12123.4269	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	280.6918	1.5338	430.5344	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1710.1847	1.5065	-2576.3679	
PV Unit electricity exported	-5793.4049	0.4660	-2699.6966	
Total			-5276.0645	(283)
Total Primary energy kWh/year			7407.9977	(286)
Target Primary Energy Rate (TPER)			48.8000	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 3	Assessment Date	27/09/2024
Property Address	Pre renewable	Date Built	
Address	Plot 3 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

EPC Rating	55 D	DER	9.45	TER	9.57
Environmental	91 B	% DER < TER			1.25
CO2 Emissions (tonnes)	1.21	DFEE	47.13	TFEE	55.10
Compliance Check	See BREL	% DFEE < TFEE			14.45
Assessor's Name	-84.41	DPER	97.62	TPER	52.94

Assessor Name	Mr. Neil Rothon	Accreditation	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	151.8100	(1b)	x 2.7900	(2b) =	423.5499	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	151.8100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		423.5499	(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	5 * 10 =	50.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) =	0.1180 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2680 (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) =	0.2278 (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	0.2905	0.2848	0.2791	0.2506	0.2449	0.2165	0.2165	0.2108	0.2278	0.2449	0.2563	0.2677	(22b)
Effective ac	0.5422	0.5406	0.5390	0.5314	0.5300	0.5234	0.5234	0.5222	0.5260	0.5300	0.5329	0.5358	(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	
Front door			1.9500	1.2000	2.3400			(26)
side door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			26.1300	1.1450	29.9198			(27)
Heatloss Floor 1			151.8100	0.1000	15.1810	75.0000	11385.7500	(28a)
External Wall 1	184.4700	30.0300	154.4400	0.1500	23.1660	110.0000	16988.4000	(29a)
External Roof 1	110.2100		110.2100	0.1200	13.2252	9.0000	991.8900	(30)
sloping	48.8300		48.8300	0.1600	7.8128	9.0000	439.4700	(30)
Total net area of external elements Aum(A, m2)			495.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		93.9848			(33)
Internal Wall 1			192.7600			9.0000	1734.8400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	31540.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		207.7620 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	21.0400	0.0310	0.6522
E3 Sill	12.6800	0.0290	0.3677
E4 Jamb	49.2200	0.0240	1.1813
E5 Ground floor (normal)	69.9800	0.0590	4.1288
E16 Corner (normal)	24.0000	0.0350	0.8400

E17 Corner (inverted - internal area greater than external area)	14.4000	-0.0660	-0.9504	
E13 Gable (insulation at rafter level)	16.4000	0.0420	0.6888	
E11 Eaves (insulation at rafter level)	8.1600	0.0220	0.1795	
R4 Ridge (vaulted ceiling)	7.2000	0.1200	0.8640	
E12 Gable (insulation at ceiling level)	11.6200	0.0410	0.4764	
E10 Eaves (insulation at ceiling level)	37.7800	0.0640	2.4179	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.8463 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 104.8312 (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	75.7834	75.5544	75.3299	74.2755	74.0782	73.1599	73.1599	72.9899	73.5137	74.0782	74.4773	74.8945	(38)
Heat transfer coeff	180.6145	180.3855	180.1610	179.1067	178.9094	177.9911	177.9911	177.8210	178.3448	178.9094	179.3085	179.7257	(39)

Average = Sum(39)m / 12 = 179.1057

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1897	1.1882	1.1868	1.1798	1.1785	1.1725	1.1725	1.1713	1.1748	1.1785	1.1811	1.1839	(40)
HLP (average)												1.1798	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9370 (42)

Hot water usage for mixer showers

73.4633	72.3593	70.7505	67.6725	65.4009	62.8677	61.4278	63.0244	64.7746	67.4945	70.6387	73.1818	(42a)

Hot water usage for baths

31.7148	31.2438	30.5806	29.3576	28.4418	27.4264	26.8779	27.5366	28.2537	29.3403	30.5884	31.6076	(42b)

Hot water usage for other uses

44.7076	43.0819	41.4561	39.8304	38.2047	36.5789	36.5789	38.2047	39.8304	41.4561	43.0819	44.7076	(42c)

Average daily hot water use (litres/day) 137.7786 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.8857	146.6850	142.7872	136.8604	132.0474	126.8731	124.8847	128.7657	132.8587	138.2908	144.3089	149.4970	(44)
Energy conte	237.3824	208.8774	219.4586	187.3551	177.7612	156.0052	151.0372	159.4388	163.8281	187.6594	205.5945	234.0762	(45)

Energy content (annual) Total = Sum(45)m = 2288.4742

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

35.6074	31.3316	32.9188	28.1033	26.6642	23.4008	22.6556	23.9158	24.5742	28.1489	30.8392	35.1114	(46)

Water storage loss:
Store volume 250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 1.0800 (55)
Total storage loss

33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)

If cylinder contains dedicated solar storage

33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

270.8624	239.1174	252.9386	219.7551	211.2412	188.4052	184.5172	192.9188	196.2281	221.1394	237.9945	267.5562	(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

270.8624	239.1174	252.9386	219.7551	211.2412	188.4052	184.5172	192.9188	196.2281	221.1394	237.9945	267.5562	(64)

Total per year (kWh/year) = Sum(64)m = 2682.6742 (64)
12Total per year (kWh/year) 2683 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

105.7136	93.6438	99.7540	88.2156	85.8896	77.7917	77.0039	79.7974	80.3928	89.1807	94.2802	104.6143	(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	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	167.3868	185.3210	167.3868	172.9663	167.3868	172.9663	167.3868	167.3868	172.9663	167.3868	172.9663	167.3868	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.4845	325.8309	317.3981	299.4457	276.7841	255.4853	241.2565	237.9101	246.3429	264.2952	286.9569	308.2556	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	(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)	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	(71)
Water heating gains (Table 5)	142.0882	139.3508	134.0779	122.5216	115.4430	108.0441	103.4998	107.2546	111.6567	119.8666	130.9447	140.6107	(72)
Total internal gains	699.0141	717.5574	685.9174	661.9883	626.6685	603.5504	579.1977	579.6061	598.0205	618.6032	657.9225	683.3077	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.3700	10.6334	0.7200	0.7000	0.7700	34.7997	(74)
East	8.7500	19.6403	0.7200	0.7000	0.7700	60.0232	(76)
South	0.3600	46.7521	0.7200	0.7000	0.7700	5.8785	(78)
West	7.6500	19.6403	0.7200	0.7000	0.7700	52.4774	(80)

Solar gains 153.1788	296.2065	487.7025	723.9640	906.7661	938.8071	889.3105	749.3925	570.2051	350.6861	190.1730	126.6053	(83)
Total gains 852.1929	1013.7639	1173.6199	1385.9523	1533.4346	1542.3575	1468.5082	1328.9985	1168.2256	969.2893	848.0955	809.9130	(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	48.5078	48.5694	48.6299	48.9161	48.9701	49.2227	49.2227	49.2698	49.1251	48.9701	48.8611	48.7477	
alpha	4.2339	4.2380	4.2420	4.2611	4.2647	4.2815	4.2815	4.2847	4.2750	4.2647	4.2574	4.2498	
util living area	0.9966	0.9924	0.9812	0.9407	0.8416	0.6725	0.5158	0.5834	0.8309	0.9693	0.9933	0.9973	(86)
MIT	19.2486	19.4654	19.8187	20.3007	20.6975	20.9173	20.9792	20.9654	20.7893	20.2538	19.6640	19.2103	(87)
Th 2	19.9282	19.9294	19.9306	19.9362	19.9372	19.9421	19.9421	19.9430	19.9402	19.9372	19.9351	19.9329	(88)
util rest of house	0.9956	0.9903	0.9755	0.9221	0.7936	0.5842	0.4000	0.4637	0.7613	0.9563	0.9909	0.9965	(89)
MIT 2	17.8807	18.1583	18.6077	19.2101	19.6703	19.8902	19.9343	19.9286	19.7818	19.1643	18.4172	17.8348	(90)
Living area fraction										fLA = Living area / (4) =		0.3844	(91)
MIT	18.4066	18.6608	19.0732	19.6294	20.0652	20.2851	20.3360	20.3272	20.1691	19.5831	18.8965	18.3636	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4066	18.6608	19.0732	19.6294	20.0652	20.2851	20.3360	20.3272	20.1691	19.5831	18.8965	18.3636	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9935	0.9866	0.9694	0.9156	0.8001	0.6144	0.4444	0.5091	0.7783	0.9506	0.9877	0.9947	(94)
Useful gains	846.6805	1000.1561	1137.7193	1269.0135	1226.8754	947.6989	652.5445	676.5792	909.2136	921.4261	837.6320	805.6517	(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	2547.8531	2482.2507	2265.2067	1921.7056	1496.6171	1011.8905	664.9740	698.3410	1082.3949	1607.1626	2115.2113	2545.5615	(97)
Space heating kWh	1265.6724	995.9676	838.8506	469.9383	200.6878	0.0000	0.0000	0.0000	0.0000	510.1879	919.8571	1294.4929	(98a)
Space heating requirement - total per year (kWh/year)												6495.6546	
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	1265.6724	995.9676	838.8506	469.9383	200.6878	0.0000	0.0000	0.0000	0.0000	510.1879	919.8571	1294.4929	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6495.6546	
Space heating per m2											(98c) / (4) =	42.7881	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 100.0000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1265.6724	995.9676	838.8506	469.9383	200.6878	0.0000	0.0000	0.0000	0.0000	510.1879	919.8571	1294.4929	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	1265.6724	995.9676	838.8506	469.9383	200.6878	0.0000	0.0000	0.0000	0.0000	510.1879	919.8571	1294.4929	(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	270.8624	239.1174	252.9386	219.7551	211.2412	188.4052	184.5172	192.9188	196.2281	221.1394	237.9945	267.5562	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month	270.8624	239.1174	252.9386	219.7551	211.2412	188.4052	184.5172	192.9188	196.2281	221.1394	237.9945	267.5562	(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	41.4974	33.2907	29.9746	21.9607	16.9631	13.8590	15.4743	20.1141	26.1262	34.2789	38.7180	42.6507	(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 6495.6546 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 100.0000

Water heating fuel used 2682.6742 (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) 334.9076 (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	9513.2364	(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	6495.6546	0.1550	1006.9818	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2682.6742	0.1412	378.6783	(264)
Space and water heating			1385.6602	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	334.9076	0.1443	48.3375	(268)
Total CO2, kg/year			1433.9977	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.4500	(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	6495.6546	1.5739	10223.7563	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2682.6742	1.5220	4082.9236	(278)
Space and water heating			14306.6798	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	334.9076	1.5338	513.6925	(282)
Total Primary energy kWh/year			14820.3723	(286)
Dwelling Primary energy Rate (DPER)			97.6200	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	151.8100	(1b)	x 2.7900	(2b) =	423.5499	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	151.8100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		423.5499	(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)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0944	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3444	(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) = 0.2928	(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	0.3733	0.3660	0.3586	0.3221	0.3147	0.2781	0.2781	0.2708	0.2928	0.3147	0.3294	0.3440	(22b)
Effective ac	0.5697	0.5670	0.5643	0.5519	0.5495	0.5387	0.5387	0.5367	0.5429	0.5495	0.5542	0.5592	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			3.9000	1.0000	3.9000			(26)
TER Opening Type (Uw = 1.20)			26.1300	1.1450	29.9198			(27)
Heatloss Floor 1			151.8100	0.1300	19.7353			(28a)
External Wall 1	184.4700	30.0300	154.4400	0.1800	27.7992			(29a)

External Roof 1	110.2100	110.2100	0.1100	12.1231		(30)
sloping	48.8300	48.8300	0.1100	5.3713		(30)
Total net area of external elements Aum(A, m2)		495.3200				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		98.8487		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 207.7620 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	21.0400	0.0500	1.0520
E3 Sill	12.6800	0.0500	0.6340
E4 Jamb	49.2200	0.0500	2.4610
E5 Ground floor (normal)	69.9800	0.1600	11.1968
E16 Corner (normal)	24.0000	0.0900	2.1600
E17 Corner (inverted - internal area greater than external area)	14.4000	-0.0900	-1.2960
E13 Gable (insulation at rafter level)	16.4000	0.0800	1.3120
E11 Eaves (insulation at rafter level)	8.1600	0.0400	0.3264
R4 Ridge (vaulted ceiling)	7.2000	0.0800	0.5760
E12 Gable (insulation at ceiling level)	11.6200	0.0600	0.6972
E10 Eaves (insulation at ceiling level)	37.7800	0.0600	2.2668

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.3862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 120.2349 (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	79.6238	79.2457	78.8750	77.1341	76.8083	75.2920	75.2920	75.0112	75.8761	76.8083	77.4673	78.1562	(38)
Heat transfer coeff	199.8588	199.4806	199.1100	197.3690	197.0433	195.5270	195.5270	195.2462	196.1110	197.0433	197.7022	198.3911	(39)
Average = Sum(39)m / 12 =												197.3675	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3165	1.3140	1.3116	1.3001	1.2980	1.2880	1.2880	1.2861	1.2918	1.2980	1.3023	1.3068	(40)
HLP (average)												1.3001	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9370 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.4633	72.3593	70.7505	67.6725	65.4009	62.8677	61.4278	63.0244	64.7746	67.4945	70.6387	73.1818	(42a)
Hot water usage for baths	31.7148	31.2438	30.5806	29.3576	28.4418	27.4264	26.8779	27.5366	28.2537	29.3403	30.5884	31.6076	(42b)
Hot water usage for other uses	44.7076	43.0819	41.4561	39.8304	38.2047	36.5789	36.5789	38.2047	39.8304	41.4561	43.0819	44.7076	(42c)
Average daily hot water use (litres/day)												137.7786	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.8857	146.6850	142.7872	136.8604	132.0474	126.8731	124.8847	128.7657	132.8587	138.2908	144.3089	149.4970	(44)
Energy conte	237.3824	208.8774	219.4586	187.3551	177.7612	156.0052	151.0372	159.4388	163.8281	187.6594	205.5945	234.0762	(45)
Energy content (annual)										Total = Sum(45)m =		2288.4742	
Distribution loss (46)m = 0.15 x (45)m	35.6074	31.3316	32.9188	28.1033	26.6642	23.4008	22.6556	23.9158	24.5742	28.1489	30.8392	35.1114	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0208	(55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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	292.2891	258.4707	274.3654	240.4907	232.6680	209.1408	205.9440	214.3456	216.9637	242.5662	258.7301	288.9830	(62)
WWHRS	-33.5844	-29.7023	-31.1025	-25.7541	-24.0019	-20.5386	-19.2517	-20.4722	-21.2500	-25.0514	-28.3802	-32.9624	(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	258.7048	228.7684	243.2629	214.7366	208.6661	188.6022	186.6924	193.8734	195.7136	217.5147	230.3499	256.0206	(64)
										Total per year (kWh/year) = Sum(64)m =		2622.9056	(64)
12Total per year (kWh/year)												2623	(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	122.8551	109.1263	116.8954	104.8041	103.0310	94.3802	94.1453	96.9388	96.9813	106.3222	110.8687	121.7558	(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	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	167.3868	185.3210	167.3868	172.9663	167.3868	172.9663	167.3868	167.3868	172.9663	167.3868	172.9663	167.3868	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.4845	325.8309	317.3981	299.4457	276.7841	255.4853	241.2565	237.9101	246.3429	264.2952	286.9569	308.2556	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	(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)	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	(71)
Water heating gains (Table 5)	165.1278	162.3904	157.1175	145.5612	138.4826	131.0836	126.5394	130.2941	134.6963	142.9061	153.9842	163.6502	(72)
Total internal gains	725.0537	743.5969	711.9570	688.0279	652.7081	626.5900	602.2373	602.6456	621.0601	644.6428	683.9621	709.3473	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.3700	10.6334	0.6300	0.7000	0.7700	30.4497	(74)
East	8.7500	19.6403	0.6300	0.7000	0.7700	52.5203	(76)
South	0.3600	46.7521	0.6300	0.7000	0.7700	5.1437	(78)
West	7.6500	19.6403	0.6300	0.7000	0.7700	45.9177	(80)

Solar gains	134.0315	259.1807	426.7397	633.4685	793.4203	821.4562	778.1467	655.7184	498.9295	306.8503	166.4013	110.7797	(83)
Total gains	859.0851	1002.7777	1138.6967	1321.4963	1446.1284	1448.0461	1380.3839	1258.3640	1119.9895	951.4931	850.3634	820.1269	(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	43.8370	43.9201	44.0019	44.3900	44.4634	44.8082	44.8082	44.8726	44.6747	44.4634	44.3152	44.1613	
alpha	3.9225	3.9280	3.9335	3.9593	3.9642	3.9872	3.9872	3.9915	3.9783	3.9642	3.9543	3.9441	
util living area	0.9964	0.9929	0.9842	0.9547	0.8807	0.7374	0.5839	0.6484	0.8669	0.9738	0.9933	0.9970	(86)
MIT	19.0459	19.2542	19.6078	20.1100	20.5583	20.8546	20.9570	20.9349	20.6975	20.1127	19.4969	19.0155	(87)
Th 2	19.8279	19.8299	19.8318	19.8408	19.8424	19.8503	19.8503	19.8517	19.8472	19.8424	19.8390	19.8355	(88)
util rest of house	0.9953	0.9907	0.9792	0.9391	0.8378	0.6451	0.4489	0.5140	0.8016	0.9621	0.9909	0.9961	(89)
MIT 2	17.5562	17.8235	18.2748	18.9098	19.4440	19.7563	19.8341	19.8242	19.6144	18.9238	18.1408	17.5222	(90)
Living area fraction										fLA = Living area / (4) =		0.3844	(91)
MIT	18.1289	18.3735	18.7872	19.3712	19.8723	20.1785	20.2658	20.2512	20.0308	19.3808	18.6621	18.0963	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1289	18.3735	18.7872	19.3712	19.8723	20.1785	20.2658	20.2512	20.0308	19.3808	18.6621	18.0963	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9929	0.9869	0.9730	0.9311	0.8391	0.6739	0.5002	0.5642	0.8139	0.9557	0.9873	0.9941	(94)
Useful gains	853.0151	989.5978	1107.9319	1230.4688	1213.3971	975.8188	690.4978	709.9658	911.5908	909.3119	839.5830	815.2862	(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	2763.8224	2687.6997	2446.5046	2066.6887	1610.3020	1090.7505	716.7567	751.9262	1163.0926	1730.2031	2285.8576	2756.8946	(97)
Space heating kWh	1421.6407	1141.1244	995.8981	602.0783	295.2973	0.0000	0.0000	0.0000	0.0000	610.7431	1041.3177	1444.5566	(98a)
Space heating requirement - total per year (kWh/year)												7552.6562	
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	1421.6407	1141.1244	995.8981	602.0783	295.2973	0.0000	0.0000	0.0000	0.0000	610.7431	1041.3177	1444.5566	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7552.6562	
Space heating per m2											(98c) / (4) =	49.7507	(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	1421.6407	1141.1244	995.8981	602.0783	295.2973	0.0000	0.0000	0.0000	0.0000	610.7431	1041.3177	1444.5566	(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)	1540.2391	1236.3212	1078.9795	652.3059	319.9320	0.0000	0.0000	0.0000	0.0000	661.6935	1128.1882	1565.0668	(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	258.7048	228.7684	243.2629	214.7366	208.6661	188.6022	186.6924	193.8734	195.7136	217.5147	230.3499	256.0206	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2844	87.1584	86.8765	86.2429	84.8383	79.8000	79.8000	79.8000	79.8000	86.2455	87.0222	87.3174	(217)
Fuel for water heating, kWh/month	296.3929	262.4742	280.0100	248.9904	245.9575	236.3437	233.9503	242.9491	245.2552	252.2040	264.7024	293.2068	(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	34.7797	27.9015	25.1222	18.4056	14.2170	11.6154	12.9693	16.8579	21.8968	28.7298	32.4502	35.7463	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-105.7293	-133.8243	-172.8520	-173.9275	-171.8403	-154.9096	-152.7103	-151.2312	-147.3661	-141.9932	-110.5191	-93.2819	(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	-116.5504	-235.2327	-450.5392	-653.7452	-843.6691	-840.5590	-830.8497	-712.8380	-535.2604	-328.4169	-152.7736	-92.9708	(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	8182.7261	(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	3102.4365	(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)	280.6918	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-7503.5896	(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	4148.2648	(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	8182.7261	0.2100	1718.3725	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3102.4365	0.2100	651.5117	(264)
Space and water heating			2369.8842	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	280.6918	0.1443	40.5125	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1710.1847	0.1370	-234.3076	
PV Unit electricity exported	-5793.4049	0.1269	-735.4043	
Total			-969.7119	(269)
Total CO2, kg/year			1452.6140	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5700	(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	8182.7261	1.1300	9246.4805	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3102.4365	1.1300	3505.7533	(278)
Space and water heating			12752.2338	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	280.6918	1.5338	430.5344	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1710.1847	1.5065	-2576.3679	
PV Unit electricity exported	-5793.4049	0.4660	-2699.6966	
Total			-5276.0645	(283)
Total Primary energy kWh/year			8036.8045	(286)
Target Primary Energy Rate (TPER)			52.9400	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 4	Assessment Date	27/09/2024
Property Type/Built Form	Pre renewable	Date of Test	
Address	Plot 4 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

SAP Rating	65 D	DER	7.21	TER	8.86
Environmental	93 A	% DER < TER			18.62
CO2 Emissions (Tonnes/annum)	1.03	DFEE	34.48	TFEE	41.16
General Requirements	See BREL	Target Fabric			16.23
Assessor's Name	-59.88	DPER	74.55	TPER	46.63

Assessor Number	Mr. Neil Rothon	Client Ref. No.	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	93.2800 (1b)	x	2.4000 (2b)	=	223.8720	(1b) - (3b)
First floor	78.6500 (1c)	x	2.6000 (2c)	=	204.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.9300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	428.3620	(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	5 * 10 =	50.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) =	0.1167 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.2667 (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) =	0.2267 (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	0.2891	0.2834	0.2777	0.2494	0.2437	0.2154	0.2154	0.2097	0.2267	0.2437	0.2551	0.2664	(22b)
Effective ac	0.5418	0.5402	0.5386	0.5311	0.5297	0.5232	0.5232	0.5220	0.5257	0.5297	0.5325	0.5355	(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	
Front door			1.9500	1.2000	2.3400			(26)
side door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			27.1500	1.1450	31.0878			(27)
Heatloss Floor 1			93.2800	0.1000	9.3280	75.0000	6996.0000	(28a)
External Wall 1	194.9100	31.0500	163.8600	0.1500	24.5790	110.0000	18024.6000	(29a)
main	78.6500		78.6500	0.1200	9.4380	9.0000	707.8500	(30)
over gf	14.6300		14.6300	0.1200	1.7556	9.0000	131.6700	(30)
Total net area of external elements Aum(A, m2)			381.4700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	80.8684			(33)
Internal Wall 1			278.0000			9.0000	2502.0000	(32c)
Internal Floor 1			78.6500			18.0000	1415.7000	(32d)
Internal Ceiling 1			78.6500			9.0000	707.8500	(32e)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			30485.6700	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							177.3144	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	41.5200	0.0590	2.4497
E16 Corner (normal)	24.8000	0.0350	0.8680

E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0660	-0.3168	
E12 Gable (insulation at ceiling level)	19.5400	0.0410	0.8011	
E10 Eaves (insulation at ceiling level)	32.8600	0.0640	2.1030	
E6 Intermediate floor within a dwelling	25.4100	0.0010	0.0254	
E24 Eaves (insulation at ceiling level - inverted)	10.8500	0.1500	1.6275	
E2 Other lintels (including other steel lintels)	23.7200	0.0310	0.7353	
E3 Sill	21.8600	0.0290	0.6339	
E4 Jamb	55.4000	0.0240	1.3296	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.2568 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 91.1252 (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	76.5855	76.3562	76.1314	75.0756	74.8780	73.9584	73.9584	73.7881	74.3127	74.8780	75.2776	75.6954	(38)
Heat transfer coeff	167.7107	167.4814	167.2566	166.2008	166.0032	165.0837	165.0837	164.9134	165.4379	166.0032	166.4029	166.8206	(39)
Average = Sum(39)m / 12 =												166.1998	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9755	0.9741	0.9728	0.9667	0.9655	0.9602	0.9602	0.9592	0.9622	0.9655	0.9679	0.9703	(40)
HLP (average)												0.9667	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9652 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.9357	72.8246	71.2055	68.1076	65.8215	63.2720	61.8228	63.4297	65.1911	67.9285	71.0929	73.6524	(42a)
Hot water usage for baths	31.9180	31.4440	30.7764	29.5456	28.6240	27.6021	27.0501	27.7130	28.4347	29.5282	30.7843	31.8101	(42b)
Hot water usage for other uses	44.9961	43.3599	41.7237	40.0874	38.4512	36.8150	36.8150	38.4512	40.0874	41.7237	43.3599	44.9961	(42c)
Average daily hot water use (litres/day)												138.6648	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8498	147.6284	143.7055	137.7407	132.8967	127.6890	125.6879	129.5939	133.7132	139.1803	145.2371	150.4586	(44)
Energy conte	238.9091	210.2209	220.8701	188.5601	178.9045	157.0086	152.0087	160.4643	164.8818	188.8664	206.9169	235.5818	(45)
Energy content (annual)										Total = Sum(45)m =		2303.1929	
Distribution loss (46)m = 0.15 x (45)m	35.8364	31.5331	33.1305	28.2840	26.8357	23.5513	22.8013	24.0696	24.7323	28.3300	31.0375	35.3373	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.0800	(55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.3891	240.4609	254.3501	220.9601	212.3845	189.4086	185.4887	193.9443	197.2818	222.3464	239.3169	269.0618	(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	272.3891	240.4609	254.3501	220.9601	212.3845	189.4086	185.4887	193.9443	197.2818	222.3464	239.3169	269.0618	(64)
										Total per year (kWh/year) = Sum(64)m =		2697.3929	(64)
12Total per year (kWh/year)												2697	(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	106.2213	94.0904	100.2233	88.6162	86.2697	78.1254	77.3269	80.1384	80.7432	89.5821	94.7199	105.1149	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	181.2340	200.6519	181.2340	187.2751	181.2340	187.2751	181.2340	181.2340	187.2751	181.2340	187.2751	181.2340	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.5129	347.0775	338.0949	318.9719	294.8325	272.1449	256.9882	253.4236	262.4063	281.5293	305.6686	328.3562	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	(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)	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	(71)
Water heating gains (Table 5)	142.7706	140.0155	134.7087	123.0781	115.9539	108.5074	103.9340	107.7129	112.1433	120.4060	131.5554	141.2835	(72)
Total internal gains	734.9947	755.2222	721.5148	696.8023	659.4977	635.4047	609.6334	609.8477	629.3020	650.6465	691.9763	718.3510	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	0.5600	10.6334	0.7200	0.7000	0.7700	2.0798	(74)
East	11.5400	19.6403	0.7200	0.7000	0.7700	79.1620	(76)
South	1.3800	46.7521	0.7200	0.7000	0.7700	22.5343	(78)
West	13.6700	19.6403	0.7200	0.7000	0.7700	93.7734	(80)

Solar gains	197.5495	379.1783	610.8939	876.5206	1065.7791	1088.3044	1037.1553	895.7815	705.1930	445.9566	244.9066	163.4192	(83)

Total gains	932.5442	1134.4005	1332.4087	1573.3229	1725.2768	1723.7091	1646.7887	1505.6293	1334.4950	1096.6031	936.8830	881.7702	(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	50.4931	50.5623	50.6302	50.9519	51.0125	51.2967	51.2967	51.3496	51.1868	51.0125	50.8900	50.7626	
alpha	4.3662	4.3708	4.3753	4.3968	4.4008	4.4198	4.4198	4.4233	4.4125	4.4008	4.3927	4.3842	
util living area													
	0.9945	0.9867	0.9658	0.8992	0.7669	0.5836	0.4344	0.4915	0.7466	0.9458	0.9887	0.9957	(86)
MIT	19.4181	19.6678	20.0382	20.4954	20.8132	20.9571	20.9907	20.9842	20.8770	20.4166	19.8268	19.3727	(87)
Th 2	20.1038	20.1050	20.1060	20.1112	20.1122	20.1166	20.1166	20.1175	20.1149	20.1122	20.1102	20.1082	(88)
util rest of house													
	0.9932	0.9836	0.9578	0.8764	0.7201	0.5130	0.3502	0.4026	0.6804	0.9286	0.9855	0.9947	(89)
MIT 2	18.2355	18.5542	19.0223	19.5852	19.9447	20.0879	20.1126	20.1100	20.0202	19.5031	18.7623	18.1805	(90)
Living area fraction										fLA = Living area / (4) =		0.1302	(91)
MIT	18.3894	18.6991	19.1545	19.7037	20.0578	20.2010	20.2269	20.2238	20.1317	19.6220	18.9009	18.3357	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3894	18.6991	19.1545	19.7037	20.0578	20.2010	20.2269	20.2238	20.1317	19.6220	18.9009	18.3357	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9895	0.9768	0.9467	0.8642	0.7169	0.5200	0.3609	0.4136	0.6818	0.9166	0.9794	0.9916	(94)
Useful gains	922.7350	1108.0727	1261.3407	1359.6863	1236.9147	896.3465	594.3628	622.7227	909.8142	1005.1182	917.5434	874.3367	(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													
	2362.9500	2311.0962	2116.5515	1795.5794	1387.4173	924.6405	598.7352	630.5946	997.8778	1497.6841	1963.7021	2358.1264	(97)
Space heating kWh													
	1071.5199	808.4317	636.2768	313.8430	111.9739	0.0000	0.0000	0.0000	0.0000	366.4690	753.2342	1103.9396	(98a)
Space heating requirement - total per year (kWh/year)												5165.6882	
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													
	1071.5199	808.4317	636.2768	313.8430	111.9739	0.0000	0.0000	0.0000	0.0000	366.4690	753.2342	1103.9396	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5165.6882	
Space heating per m2											(98c) / (4) =	30.0453	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1071.5199	808.4317	636.2768	313.8430	111.9739	0.0000	0.0000	0.0000	0.0000	366.4690	753.2342	1103.9396	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	1071.5199	808.4317	636.2768	313.8430	111.9739	0.0000	0.0000	0.0000	0.0000	366.4690	753.2342	1103.9396	(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													
	272.3891	240.4609	254.3501	220.9601	212.3845	189.4086	185.4887	193.9443	197.2818	222.3464	239.3169	269.0618	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	272.3891	240.4609	254.3501	220.9601	212.3845	189.4086	185.4887	193.9443	197.2818	222.3464	239.3169	269.0618	(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	45.9061	36.8276	33.1591	24.2938	18.7652	15.3314	17.1183	22.2510	28.9018	37.9207	42.8314	47.1819	(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												5165.6882	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												2697.3929	(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)												370.4883	(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	8233.5694	(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	5165.6882	0.1557	804.5376	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2697.3929	0.1412	380.7622	(264)
Space and water heating			1185.2998	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	370.4883	0.1443	53.4729	(268)
Total CO2, kg/year			1238.7727	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.2100	(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	5165.6882	1.5766	8144.2012	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2697.3929	1.5220	4105.3481	(278)
Space and water heating			12249.5493	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	370.4883	1.5338	568.2673	(282)
Total Primary energy kWh/year			12817.8166	(286)
Dwelling Primary energy Rate (DPER)			74.5500	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	93.2800 (1b)	x	2.4000 (2b)	=	223.8720	(1b) - (3b)
First floor	78.6500 (1c)	x	2.6000 (2c)	=	204.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.9300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	428.3620	(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)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0934 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3434 (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) =	0.2919 (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	0.3721	0.3648	0.3575	0.3211	0.3138	0.2773	0.2773	0.2700	0.2919	0.3138	0.3284	0.3429	(22b)
Effective ac	0.5692	0.5666	0.5639	0.5515	0.5492	0.5384	0.5384	0.5364	0.5426	0.5492	0.5539	0.5588	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			3.9000	1.0000	3.9000			(26)

TER Opening Type (Uw = 1.20)			27.1500	1.1450	31.0878	(27)
Heatloss Floor 1			93.2800	0.1300	12.1264	(28a)
External Wall 1	194.9100	31.0500	163.8600	0.1800	29.4948	(29a)
main	78.6500		78.6500	0.1100	8.6515	(30)
over gf	14.6300		14.6300	0.1100	1.6093	(30)
Total net area of external elements Aum(A, m2)			381.4700			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		86.8698	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 177.3144 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	41.5200	0.1600	6.6432
E16 Corner (normal)	24.8000	0.0900	2.2320
E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0900	-0.4320
E12 Gable (insulation at ceiling level)	19.5400	0.0600	1.1724
E10 Eaves (insulation at ceiling level)	32.8600	0.0600	1.9716
E6 Intermediate floor within a dwelling	25.4100	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	10.8500	0.2400	2.6040
E2 Other lintels (including other steel lintels)	23.7200	0.0500	1.1860
E3 Sill	21.8600	0.0500	1.0930
E4 Jamb	55.4000	0.0500	2.7700

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.2402 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 106.1100 (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	80.4679	80.0878	79.7152	77.9653	77.6379	76.1138	76.1138	75.8316	76.7009	77.6379	78.3003	78.9927	(38)
Heat transfer coeff	186.5779	186.1978	185.8252	184.0753	183.7479	182.2238	182.2238	181.9416	182.8109	183.7479	184.4102	185.1027	(39)

Average = Sum(39)m / 12 = 184.0738

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0852	1.0830	1.0808	1.0706	1.0687	1.0599	1.0599	1.0582	1.0633	1.0687	1.0726	1.0766	(40)
HLP (average)												1.0706	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9652 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.9357	72.8246	71.2055	68.1076	65.8215	63.2720	61.8228	63.4297	65.1911	67.9285	71.0929	73.6524	(42a)
Hot water usage for baths	31.9180	31.4440	30.7764	29.5456	28.6240	27.6021	27.0501	27.7130	28.4347	29.5282	30.7843	31.8101	(42b)
Hot water usage for other uses	44.9961	43.3599	41.7237	40.0874	38.4512	36.8150	36.8150	38.4512	40.0874	41.7237	43.3599	44.9961	(42c)

Average daily hot water use (litres/day) 138.6648 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8498	147.6284	143.7055	137.7407	132.8967	127.6890	125.6879	129.5939	133.7132	139.1803	145.2371	150.4586	(44)
Energy conte	238.9091	210.2209	220.8701	188.5601	178.9045	157.0086	152.0087	160.4643	164.8818	188.8664	206.9169	235.5818	(45)
Energy content (annual)										Total = Sum(45)m =		2303.1929	
Distribution loss (46)m = 0.15 x (45)m	35.8364	31.5331	33.1305	28.2840	26.8357	23.5513	22.8013	24.0696	24.7323	28.3300	31.0375	35.3373	(46)

Water storage loss:

Store volume 250.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.8903 (48)

Temperature factor from Table 2b 0.5400 (49)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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	293.8159	259.8141	275.7769	241.6957	233.8113	210.1442	206.9154	215.3711	218.0174	243.7732	260.0525	290.4886	(62)
WWHRS	-33.8003	-29.8933	-31.3025	-25.9197	-24.1562	-20.6707	-19.3755	-20.6039	-21.3867	-25.2125	-28.5627	-33.1744	(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	260.0156	229.9208	244.4744	215.7760	209.6550	189.4735	187.5400	194.7672	196.6307	218.5606	231.4897	257.3142	(64)
									Total per year (kWh/year) = Sum(64)m =			2635.6178	(64)
12Total per year (kWh/year)												2636	(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	123.3627	109.5730	117.3647	105.2047	103.4112	94.7138	94.4683	97.2798	97.3317	106.7235	111.3083	122.2564	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	181.2340	200.6519	181.2340	187.2751	181.2340	187.2751	181.2340	181.2340	187.2751	181.2340	187.2751	181.2340	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.5129	347.0775	338.0949	318.9719	294.8325	272.1449	256.9882	253.4236	262.4063	281.5293	305.6686	328.3562	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	(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)	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	(71)
Water heating gains (Table 5)	165.8101	163.0551	157.7483	146.1177	138.9935	131.5470	126.9735	130.7524	135.1829	143.4456	154.5949	164.3231	(72)
Total internal gains	761.0343	781.2618	747.5544	722.8419	685.5372	658.4443	632.6730	632.8873	652.3415	676.6861	718.0159	744.3905	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	0.5600	10.6334	0.6300	0.7000	0.7700	1.8198	(74)
East	11.5400	19.6403	0.6300	0.7000	0.7700	69.2668	(76)
South	1.3800	46.7521	0.6300	0.7000	0.7700	19.7175	(78)
West	13.6700	19.6403	0.6300	0.7000	0.7700	82.0517	(80)

Solar gains	172.8558	331.7810	534.5322	766.9555	932.5567	952.2664	907.5109	783.8089	617.0439	390.2121	214.2933	142.9918	(83)
Total gains	933.8901	1113.0428	1282.0865	1489.7974	1618.0939	1610.7106	1540.1838	1416.6961	1269.3854	1066.8981	932.3092	887.3823	(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	45.3872	45.4798	45.5710	46.0042	46.0862	46.4717	46.4717	46.5437	46.3224	46.0862	45.9207	45.7489	
alpha	4.0258	4.0320	4.0381	4.0669	4.0724	4.0981	4.0981	4.1029	4.0882	4.0724	4.0614	4.0499	
util living area	0.9945	0.9883	0.9732	0.9258	0.8241	0.6581	0.5027	0.5608	0.8009	0.9566	0.9895	0.9955	(86)
MIT	19.2019	19.4389	19.8093	20.3003	20.6902	20.9122	20.9773	20.9649	20.7977	20.2651	19.6469	19.1658	(87)
Th 2	20.0129	20.0148	20.0165	20.0249	20.0264	20.0337	20.0337	20.0351	20.0309	20.0264	20.0233	20.0200	(88)
util rest of house	0.9932	0.9855	0.9665	0.9067	0.7798	0.5795	0.4002	0.4557	0.7356	0.9416	0.9864	0.9944	(89)
MIT 2	17.8985	18.2019	18.6725	19.2869	19.7423	19.9736	20.0238	20.0183	19.8713	19.2559	18.4746	17.8571	(90)
Living area fraction									fLA = Living area / (4) =			0.1302	(91)
MIT	18.0682	18.3629	18.8205	19.4188	19.8657	20.0958	20.1479	20.1415	19.9919	19.3873	18.6272	18.0275	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0682	18.3629	18.8205	19.4188	19.8657	20.0958	20.1479	20.1415	19.9919	19.3873	18.6272	18.0275	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9891	0.9786	0.9553	0.8920	0.7714	0.5849	0.4127	0.4679	0.7326	0.9285	0.9799	0.9910	(94)
Useful gains	923.7124	1089.2058	1224.7311	1328.8511	1248.2621	942.1710	635.6897	662.8299	929.9420	990.6199	913.6095	879.3998	(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	2568.8410	2506.7704	2289.4597	1936.2522	1500.4311	1001.4571	646.5152	680.7382	1077.1077	1614.6449	2125.7289	2559.5073	(97)
Space heating kWh	1223.9757	952.6034	792.1581	437.3288	187.6137	0.0000	0.0000	0.0000	0.0000	464.2746	872.7260	1250.0000	(98a)
Space heating requirement - total per year (kWh/year)												6180.6803	
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	1223.9757	952.6034	792.1581	437.3288	187.6137	0.0000	0.0000	0.0000	0.0000	464.2746	872.7260	1250.0000	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6180.6803	
Space heating per m2										(98c) / (4) =		35.9488	(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	1223.9757	952.6034	792.1581	437.3288	187.6137	0.0000	0.0000	0.0000	0.0000	464.2746	872.7260	1250.0000	(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)	1326.0842	1032.0730	858.2428	473.8123	203.2651	0.0000	0.0000	0.0000	0.0000	503.0061	945.5319	1354.2796	(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	260.0156	229.9208	244.4744	215.7760	209.6550	189.4735	187.5400	194.7672	196.6307	218.5606	231.4897	257.3142	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.0792	86.8945	86.4993	85.6100	83.8116	79.8000	79.8000	79.8000	79.8000	85.7061	86.7489	87.1226	(217)
Fuel for water heating, kWh/month	298.5966	264.5976	282.6316	252.0452	250.1505	237.4355	235.0125	244.0692	246.4044	255.0118	266.8503	295.3472	(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	37.6568	30.2097	27.2005	19.9283	15.3932	12.5763	14.0422	18.2525	23.7082	31.1065	35.1347	38.7034	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-77.8912	-105.3372	-145.2446	-156.3343	-162.7787	-149.7227	-147.6626	-142.0500	-131.5632	-116.8531	-83.9355	-67.8602	(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	-58.6891	-121.4307	-237.7995	-352.2310	-461.2033	-461.9452	-456.6881	-388.8793	-287.8782	-172.1914	-77.8453	-46.5832	(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	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	6696.2950	(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	3128.1522	(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)	303.9123	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4610.5977	(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	5603.7618	(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	6696.2950	0.2100	1406.2219	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3128.1522	0.2100	656.9120	(264)
Space and water heating			2063.1339	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	303.9123	0.1443	43.8639	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1487.2333	0.1355	-201.5603	
PV Unit electricity exported	-3123.3644	0.1263	-394.4854	
Total			-596.0457	(269)
Total CO2, kg/year			1522.8814	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.8600	(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	6696.2950	1.1300	7566.8133	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3128.1522	1.1300	3534.8120	(278)
Space and water heating			11101.6254	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	303.9123	1.5338	466.1508	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1487.2333	1.5009	-2232.2435	
PV Unit electricity exported	-3123.3644	0.4636	-1448.0872	
Total			-3680.3307	(283)
Total Primary energy kWh/year			8017.5462	(286)
Target Primary Energy Rate (TPER)			46.6300	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 5	Assessment Date	27/09/2024
Property Type/Built Form	Pre renewable	Date of Test	
Address	Plot 5 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

SAP Rating	62 D	DER	7.78	TER	9.66
Environmental	92 A	% DER < TER			19.46
CO2 Emissions (tonne)	1.13	DFEE	37.89	TFEE	44.51
Compliance Check	See BREL	% DFEE < TFEE			14.86
Assessor's Name	-58.16	DPER	80.57	TPER	50.94

Assessor Name	Mr. Neil Rothon	Accreditation	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	93.2800 (1b)	x	2.4000 (2b)	=	223.8720	(1b) - (3b)
First floor	78.6500 (1c)	x	2.6000 (2c)	=	204.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.9300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	428.3620	(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	5 * 10 =	50.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) =	0.1167	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2667	(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) =	0.2267	(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	0.2891	0.2834	0.2777	0.2494	0.2437	0.2154	0.2154	0.2097	0.2267	0.2437	0.2551	0.2664	(22b)
Effective ac	0.5418	0.5402	0.5386	0.5311	0.5297	0.5232	0.5232	0.5220	0.5257	0.5297	0.5325	0.5355	(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	
Front door			1.9500	1.2000	2.3400			(26)
side door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			27.1500	1.1450	31.0878			(27)
Heatloss Floor 1			93.2800	0.1000	9.3280	75.0000	6996.0000	(28a)
External Wall 1	194.9100	31.0500	163.8600	0.1500	24.5790	110.0000	18024.6000	(29a)
main	78.6500		78.6500	0.1200	9.4380	9.0000	707.8500	(30)
over gf	14.6300		14.6300	0.1200	1.7556	9.0000	131.6700	(30)
Total net area of external elements Aum(A, m2)			381.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		80.8684			(33)
Internal Wall 1			278.0000			9.0000	2502.0000	(32c)
Internal Floor 1			78.6500			18.0000	1415.7000	(32d)
Internal Ceiling 1			78.6500			9.0000	707.8500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		30485.6700	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							177.3144	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	41.5200	0.0590	2.4497
E16 Corner (normal)	24.8000	0.0350	0.8680

E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0660	-0.3168	
E12 Gable (insulation at ceiling level)	19.5400	0.0410	0.8011	
E10 Eaves (insulation at ceiling level)	32.8600	0.0640	2.1030	
E6 Intermediate floor within a dwelling	25.4100	0.0010	0.0254	
E24 Eaves (insulation at ceiling level - inverted)	10.8500	0.1500	1.6275	
E2 Other lintels (including other steel lintels)	23.7200	0.0310	0.7353	
E3 Sill	21.8600	0.0290	0.6339	
E4 Jamb	55.4000	0.0240	1.3296	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.2568 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 91.1252 (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	76.5855	76.3562	76.1314	75.0756	74.8780	73.9584	73.9584	73.7881	74.3127	74.8780	75.2776	75.6954	(38)
Heat transfer coeff	167.7107	167.4814	167.2566	166.2008	166.0032	165.0837	165.0837	164.9134	165.4379	166.0032	166.4029	166.8206	(39)
Average = Sum(39)m / 12 =												166.1998	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9755	0.9741	0.9728	0.9667	0.9655	0.9602	0.9602	0.9592	0.9622	0.9655	0.9679	0.9703	(40)
HLP (average)												0.9667	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9652 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.9357	72.8246	71.2055	68.1076	65.8215	63.2720	61.8228	63.4297	65.1911	67.9285	71.0929	73.6524	(42a)
Hot water usage for baths	31.9180	31.4440	30.7764	29.5456	28.6240	27.6021	27.0501	27.7130	28.4347	29.5282	30.7843	31.8101	(42b)
Hot water usage for other uses	44.9961	43.3599	41.7237	40.0874	38.4512	36.8150	36.8150	38.4512	40.0874	41.7237	43.3599	44.9961	(42c)
Average daily hot water use (litres/day)												138.6648	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8498	147.6284	143.7055	137.7407	132.8967	127.6890	125.6879	129.5939	133.7132	139.1803	145.2371	150.4586	(44)
Energy conte	238.9091	210.2209	220.8701	188.5601	178.9045	157.0086	152.0087	160.4643	164.8818	188.8664	206.9169	235.5818	(45)
Energy content (annual)										Total = Sum(45)m =		2303.1929	
Distribution loss (46)m = 0.15 x (45)m	35.8364	31.5331	33.1305	28.2840	26.8357	23.5513	22.8013	24.0696	24.7323	28.3300	31.0375	35.3373	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.0800	(55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.3891	240.4609	254.3501	220.9601	212.3845	189.4086	185.4887	193.9443	197.2818	222.3464	239.3169	269.0618	(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	272.3891	240.4609	254.3501	220.9601	212.3845	189.4086	185.4887	193.9443	197.2818	222.3464	239.3169	269.0618	(64)
										Total per year (kWh/year) = Sum(64)m =		2697.3929	(64)
12Total per year (kWh/year)												2697	(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	106.2213	94.0904	100.2233	88.6162	86.2697	78.1254	77.3269	80.1384	80.7432	89.5821	94.7199	105.1149	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	181.2340	200.6519	181.2340	187.2751	181.2340	187.2751	181.2340	181.2340	187.2751	181.2340	187.2751	181.2340	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.5129	347.0775	338.0949	318.9719	294.8325	272.1449	256.9882	253.4236	262.4063	281.5293	305.6686	328.3562	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	(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)	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	(71)
Water heating gains (Table 5)	142.7706	140.0155	134.7087	123.0781	115.9539	108.5074	103.9340	107.7129	112.1433	120.4060	131.5554	141.2835	(72)
Total internal gains	734.9947	755.2222	721.5148	696.8023	659.4977	635.4047	609.6334	609.8477	629.3020	650.6465	691.9763	718.3510	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	25.2100	10.6334	0.7200	0.7000	0.7700	93.6286	(74)
East	1.3800	19.6403	0.7200	0.7000	0.7700	9.4665	(76)
West	0.5600	19.6403	0.7200	0.7000	0.7700	3.8415	(80)

Solar gains	106.9366	204.9623	346.9172	550.9007	734.5131	782.7278	732.2209	585.8240	415.4227	243.8823	132.0964	88.9973	(83)
Total gains	841.9313	960.1845	1068.4320	1247.7030	1394.0108	1418.1325	1341.8543	1195.6717	1044.7247	894.5288	824.0728	807.3482	(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	50.4931	50.5623	50.6302	50.9519	51.0125	51.2967	51.2967	51.3496	51.1868	51.0125	50.8900	50.7626	
alpha	4.3662	4.3708	4.3753	4.3968	4.4008	4.4198	4.4198	4.4233	4.4125	4.4008	4.3927	4.3842	
util living area													
	0.9963	0.9929	0.9843	0.9496	0.8539	0.6801	0.5242	0.6006	0.8494	0.9725	0.9931	0.9970	(86)
MIT	19.3433	19.5276	19.8394	20.3008	20.7008	20.9220	20.9806	20.9657	20.7847	20.2750	19.7355	19.3109	(87)
Th 2	20.1038	20.1050	20.1060	20.1112	20.1122	20.1166	20.1166	20.1175	20.1149	20.1122	20.1102	20.1082	(88)
util rest of house													
	0.9954	0.9912	0.9803	0.9360	0.8156	0.6065	0.4265	0.4994	0.7949	0.9627	0.9911	0.9962	(89)
MIT 2	18.1400	18.3763	18.7742	19.3560	19.8302	20.0616	20.1077	20.1001	19.9359	19.3324	18.6466	18.1016	(90)
Living area fraction										fLA = Living area / (4) =		0.1302	(91)
MIT	18.2966	18.5262	18.9128	19.4790	19.9435	20.1736	20.2213	20.2128	20.0464	19.4551	18.7883	18.2590	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2966	18.5262	18.9128	19.4790	19.9435	20.1736	20.2213	20.2128	20.0464	19.4551	18.7883	18.2590	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9927	0.9867	0.9727	0.9238	0.8072	0.6116	0.4385	0.5109	0.7899	0.9528	0.9866	0.9939	(94)
Useful gains	835.7678	947.4190	1039.2649	1152.5793	1125.2831	867.2935	588.4054	610.8573	825.2575	852.2888	813.0412	802.3971	(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													
	2347.3875	2282.1304	2076.1293	1758.2355	1368.4551	920.1105	597.8242	628.7750	983.7590	1469.9745	1944.9709	2345.3300	(97)
Space heating kWh													
	1124.6450	896.9261	771.4271	436.0724	180.9200	0.0000	0.0000	0.0000	0.0000	459.5582	814.9894	1147.9421	(98a)
Space heating requirement - total per year (kWh/year)												5832.4803	
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													
	1124.6450	896.9261	771.4271	436.0724	180.9200	0.0000	0.0000	0.0000	459.5582	814.9894	1147.9421	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												5832.4803	
Space heating per m2											(98c) / (4) =	33.9236	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1124.6450	896.9261	771.4271	436.0724	180.9200	0.0000	0.0000	0.0000	0.0000	459.5582	814.9894	1147.9421	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	1124.6450	896.9261	771.4271	436.0724	180.9200	0.0000	0.0000	0.0000	0.0000	459.5582	814.9894	1147.9421	(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													
	272.3891	240.4609	254.3501	220.9601	212.3845	189.4086	185.4887	193.9443	197.2818	222.3464	239.3169	269.0618	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	272.3891	240.4609	254.3501	220.9601	212.3845	189.4086	185.4887	193.9443	197.2818	222.3464	239.3169	269.0618	(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	45.9061	36.8276	33.1591	24.2938	18.7652	15.3314	17.1183	22.2510	28.9018	37.9207	42.8314	47.1819	(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												5832.4803	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												2697.3929	(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)												370.4883	(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	8900.3615	(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	5832.4803	0.1550	903.7713	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2697.3929	0.1412	380.7622	(264)
Space and water heating			1284.5335	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	370.4883	0.1443	53.4729	(268)
Total CO2, kg/year			1338.0064	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.7800	(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	5832.4803	1.5737	9178.5292	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2697.3929	1.5220	4105.3481	(278)
Space and water heating			13283.8774	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	370.4883	1.5338	568.2673	(282)
Total Primary energy kWh/year			13852.1447	(286)
Dwelling Primary energy Rate (DPER)			80.5700	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		93.2800 (1b)	x	2.4000 (2b)	=	223.8720	(1b) - (3b)
First floor		78.6500 (1c)	x	2.6000 (2c)	=	204.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.9300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	428.3620	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0934	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3434	(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) =	0.2919	(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	0.3721	0.3648	0.3575	0.3211	0.3138	0.2773	0.2773	0.2700	0.2919	0.3138	0.3284	0.3429	(22b)
Effective ac	0.5692	0.5666	0.5639	0.5515	0.5492	0.5384	0.5384	0.5364	0.5426	0.5492	0.5539	0.5588	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			3.9000	1.0000	3.9000			(26)
TER Opening Type (Uw = 1.20)			27.1500	1.1450	31.0878			(27)

Heatloss Floor 1			93.2800	0.1300	12.1264		(28a)
External Wall 1	194.9100	31.0500	163.8600	0.1800	29.4948		(29a)
main	78.6500		78.6500	0.1100	8.6515		(30)
over gf	14.6300		14.6300	0.1100	1.6093		(30)
Total net area of external elements Aum(A, m2)			381.4700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		86.8698		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 177.3144 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	41.5200	0.1600	6.6432
E16 Corner (normal)	24.8000	0.0900	2.2320
E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0900	-0.4320
E12 Gable (insulation at ceiling level)	19.5400	0.0600	1.1724
E10 Eaves (insulation at ceiling level)	32.8600	0.0600	1.9716
E6 Intermediate floor within a dwelling	25.4100	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	10.8500	0.2400	2.6040
E2 Other lintels (including other steel lintels)	23.7200	0.0500	1.1860
E3 Sill	21.8600	0.0500	1.0930
E4 Jamb	55.4000	0.0500	2.7700

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.2402 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 106.1100 (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	80.4679	80.0878	79.7152	77.9653	77.6379	76.1138	76.1138	75.8316	76.7009	77.6379	78.3003	78.9927	(38)
Heat transfer coeff	186.5779	186.1978	185.8252	184.0753	183.7479	182.2238	182.2238	181.9416	182.8109	183.7479	184.4102	185.1027	(39)
Average = Sum(39)m / 12 =												184.0738	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0852	1.0830	1.0808	1.0706	1.0687	1.0599	1.0599	1.0582	1.0633	1.0687	1.0726	1.0766	(40)
HLP (average)												1.0706	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9652 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.9357	72.8246	71.2055	68.1076	65.8215	63.2720	61.8228	63.4297	65.1911	67.9285	71.0929	73.6524	(42a)
Hot water usage for baths	31.9180	31.4440	30.7764	29.5456	28.6240	27.6021	27.0501	27.7130	28.4347	29.5282	30.7843	31.8101	(42b)
Hot water usage for other uses	44.9961	43.3599	41.7237	40.0874	38.4512	36.8150	36.8150	38.4512	40.0874	41.7237	43.3599	44.9961	(42c)
Average daily hot water use (litres/day)												138.6648	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8498	147.6284	143.7055	137.7407	132.8967	127.6890	125.6879	129.5939	133.7132	139.1803	145.2371	150.4586	(44)
Energy conte	238.9091	210.2209	220.8701	188.5601	178.9045	157.0086	152.0087	160.4643	164.8818	188.8664	206.9169	235.5818	(45)
Energy content (annual)										Total = Sum(45)m =		2303.1929	
Distribution loss (46)m = 0.15 x (45)m	35.8364	31.5331	33.1305	28.2840	26.8357	23.5513	22.8013	24.0696	24.7323	28.3300	31.0375	35.3373	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0208	(55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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	293.8159	259.8141	275.7769	241.6957	233.8113	210.1442	206.9154	215.3711	218.0174	243.7732	260.0525	290.4886	(62)
WWHRS	-33.8003	-29.8933	-31.3025	-25.9197	-24.1562	-20.6707	-19.3755	-20.6039	-21.3867	-25.2125	-28.5627	-33.1744	(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	260.0156	229.9208	244.4744	215.7760	209.6550	189.4735	187.5400	194.7672	196.6307	218.5606	231.4897	257.3142	(64)
									Total per year (kWh/year) = Sum(64)m =			2635.6178	(64)
12Total per year (kWh/year)												2636	(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	123.3627	109.5730	117.3647	105.2047	103.4112	94.7138	94.4683	97.2798	97.3317	106.7235	111.3083	122.2564	(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	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	181.2340	200.6519	181.2340	187.2751	181.2340	187.2751	181.2340	181.2340	187.2751	181.2340	187.2751	181.2340	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.5129	347.0775	338.0949	318.9719	294.8325	272.1449	256.9882	253.4236	262.4063	281.5293	305.6686	328.3562	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	(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)	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	(71)
Water heating gains (Table 5)	165.8101	163.0551	157.7483	146.1177	138.9935	131.5470	126.9735	130.7524	135.1829	143.4456	154.5949	164.3231	(72)
Total internal gains	761.0343	781.2618	747.5544	722.8419	685.5372	658.4443	632.6730	632.8873	652.3415	676.6861	718.0159	744.3905	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	25.2100	10.6334	0.6300	0.7000	0.7700	81.9250	(74)
East	1.3800	19.6403	0.6300	0.7000	0.7700	8.2832	(76)
West	0.5600	19.6403	0.6300	0.7000	0.7700	3.3613	(80)

Solar gains	93.5695	179.3420	303.5526	482.0381	642.6990	684.8869	640.6932	512.5960	363.4949	213.3970	115.5844	77.8726	(83)
Total gains	854.6038	960.6038	1051.1069	1204.8800	1328.2362	1343.3311	1273.3662	1145.4832	1015.8364	890.0831	833.6003	822.2631	(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	45.3872	45.4798	45.5710	46.0042	46.0862	46.4717	46.4717	46.5437	46.3224	46.0862	45.9207	45.7489	
alpha	4.0258	4.0320	4.0381	4.0669	4.0724	4.0981	4.0981	4.1029	4.0882	4.0724	4.0614	4.0499	
util living area	0.9960	0.9931	0.9863	0.9605	0.8894	0.7433	0.5910	0.6626	0.8797	0.9757	0.9929	0.9966	(86)
MIT	19.1381	19.3187	19.6356	20.1172	20.5645	20.8613	20.9592	20.9355	20.6960	20.1395	19.5687	19.1132	(87)
Th 2	20.0129	20.0148	20.0165	20.0249	20.0264	20.0337	20.0337	20.0351	20.0309	20.0264	20.0233	20.0200	(88)
util rest of house	0.9950	0.9913	0.9825	0.9489	0.8552	0.6667	0.4774	0.5501	0.8287	0.9666	0.9908	0.9958	(89)
MIT 2	17.8172	18.0492	18.4546	19.0673	19.6090	19.9334	20.0149	20.0019	19.7739	19.1031	18.3754	17.7899	(90)
Living area fraction										fLA = Living area / (4) =		0.1302	(91)
MIT	17.9891	18.2145	18.6083	19.2040	19.7334	20.0542	20.1378	20.1234	19.8939	19.2380	18.5308	17.9621	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9891	18.2145	18.6083	19.2040	19.7334	20.0542	20.1378	20.1234	19.8939	19.2380	18.5308	17.9621	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9919	0.9865	0.9748	0.9360	0.8428	0.6685	0.4904	0.5613	0.8199	0.9560	0.9859	0.9930	(94)
Useful gains	847.6460	947.6268	1024.6225	1127.7096	1119.4353	898.0361	624.4830	643.0069	832.8671	850.9237	821.8504	816.5310	(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	2554.0835	2479.1292	2250.0304	1896.7064	1476.1218	993.8801	644.6707	677.4478	1059.1879	1587.2120	2107.9488	2547.4042	(97)
Space heating kWh	1269.5895	1029.1696	911.7034	553.6777	265.3748	0.0000	0.0000	0.0000	0.0000	547.7985	925.9908	1287.7696	(98a)
Space heating requirement - total per year (kWh/year)												6791.0739	
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	1269.5895	1029.1696	911.7034	553.6777	265.3748	0.0000	0.0000	0.0000	0.0000	547.7985	925.9908	1287.7696	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6791.0739	
Space heating per m2											(98c) / (4) =	39.4991	(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	1269.5895	1029.1696	911.7034	553.6777	265.3748	0.0000	0.0000	0.0000	0.0000	547.7985	925.9908	1287.7696	(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)	1375.5032	1115.0267	987.7610	599.8675	287.5133	0.0000	0.0000	0.0000	0.0000	593.4978	1003.2403	1395.2000	(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	260.0156	229.9208	244.4744	215.7760	209.6550	189.4735	187.5400	194.7672	196.6307	218.5606	231.4897	257.3142	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.1296	87.0081	86.7316	86.0776	84.5894	79.8000	79.8000	79.8000	79.8000	86.0328	86.8412	87.1629	(217)
Fuel for water heating, kWh/month	298.4241	264.2523	281.8745	250.6761	247.8501	237.4355	235.0125	244.0692	246.4044	254.0434	266.5666	295.2108	(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	37.6568	30.2097	27.2005	19.9283	15.3932	12.5763	14.0422	18.2525	23.7082	31.1065	35.1347	38.7034	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-77.8912	-105.3372	-145.2446	-156.3343	-162.7787	-149.7227	-147.6626	-142.0500	-131.5632	-116.8531	-83.9355	-67.8602	(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	-58.6891	-121.4307	-237.7995	-352.2310	-461.2033	-461.9452	-456.6881	-388.8793	-287.8782	-172.1914	-77.8453	-46.5832	(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	7357.6099	(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	3121.8195	(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)	303.9123	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4610.5977	(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	6258.7439	(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	7357.6099	0.2100	1545.0981	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3121.8195	0.2100	655.5821	(264)
Space and water heating			2200.6802	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	303.9123	0.1443	43.8639	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1487.2333	0.1355	-201.5603	
PV Unit electricity exported	-3123.3644	0.1263	-394.4854	
Total			-596.0457	(269)
Total CO2, kg/year			1660.4276	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6600	(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	7357.6099	1.1300	8314.0992	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3121.8195	1.1300	3527.6560	(278)
Space and water heating			11841.7552	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	303.9123	1.5338	466.1508	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1487.2333	1.5009	-2232.2435	
PV Unit electricity exported	-3123.3644	0.4636	-1448.0872	
Total			-3680.3307	(283)
Total Primary energy kWh/year			8757.6760	(286)
Target Primary Energy Rate (TPER)			50.9400	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 6	Assessment Date	27/09/2024
Property Type/Built Form	Pre renewable	Date of Test	
Address	Plot 7 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

SAP Rating	64 D	DER	7.04	TER	8.55
Environment	93 A	% DER < TER			17.66
CO2 Emissions (Tonnes)	1.13	DFEE	34.11	TFEE	40.81
Compliance Check	See BREL	% DFEE < TFEE			16.42
Spec DER / TER	-61.17	DPER	72.82	TPER	45.18

Assessor Details	Mr. Neil Rothon	Assessor ID	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	103.8800 (1b)	x	2.4000 (2b)	=	249.3120	(1b) - (3b)
First floor	88.3200 (1c)	x	2.6000 (2c)	=	229.6320	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	192.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	478.9440	(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		5 * 10 =	50.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) =	0.1044	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2544	(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) =	0.2162	(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	0.2757	0.2703	0.2649	0.2379	0.2325	0.2054	0.2054	0.2000	0.2162	0.2325	0.2433	0.2541	(22b)
Effective ac	0.5380	0.5365	0.5351	0.5283	0.5270	0.5211	0.5211	0.5200	0.5234	0.5270	0.5296	0.5323	(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	
Front door			1.9500	1.2000	2.3400			(26)
side door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			26.1100	1.1450	29.8969			(27)
to garage			1.9500	1.4000	2.7300			(26)
Heatloss Floor 1			103.8800	0.1000	10.3880	75.0000	7791.0000	(28a)
External Wall 1	221.1500	31.9600	189.1900	0.1500	28.3785	110.0000	20810.9000	(29a)
main	88.3200		88.3200	0.1200	10.5984	9.0000	794.8800	(30)
over gf	15.5600		15.5600	0.1200	1.8672	9.0000	140.0400	(30)
Total net area of external elements Aum(A, m2)			428.9100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.5390			(33)
Internal Wall 1			298.7400			9.0000	2688.6600	(32c)
Internal Floor 1			88.3200			18.0000	1589.7600	(32d)
Internal Ceiling 1			88.3200			9.0000	794.8800	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		34610.1200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							180.0735	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	46.9100	0.0590	2.7677

E16 Corner (normal)	24.8000	0.0350	0.8680	
E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0660	-0.3168	
E12 Gable (insulation at ceiling level)	16.1600	0.0410	0.6626	
E10 Eaves (insulation at ceiling level)	34.7600	0.0640	2.2246	
E2 Other lintels (including other steel lintels)	24.1500	0.0310	0.7486	
E3 Sill	21.3600	0.0290	0.6194	
E4 Jamb	53.9000	0.0240	1.2936	
E6 Intermediate floor within a dwelling	28.6800	0.0010	0.0287	
E24 Eaves (insulation at ceiling level - inverted)	10.3000	0.1500	1.5450	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4415 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 98.9805 (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	85.0326	84.7994	84.5707	83.4969	83.2959	82.3606	82.3606	82.1874	82.7209	83.2959	83.7024	84.1273	(38)
Heat transfer coeff	184.0131	183.7799	183.5513	182.4774	182.2764	181.3411	181.3411	181.1679	181.7014	182.2764	182.6829	183.1078	(39)

Average = Sum(39)m / 12 = 182.4764

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9574	0.9562	0.9550	0.9494	0.9484	0.9435	0.9435	0.9426	0.9454	0.9484	0.9505	0.9527	(40)
HLP (average)												0.9494	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9918 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	74.3819	73.2641	71.6352	68.5186	66.2187	63.6538	62.1959	63.8125	65.5845	68.3384	71.5219	74.0969	(42a)
Hot water usage for baths	32.1099	31.6330	30.9614	29.7232	28.7961	27.7680	27.2127	27.8796	28.6056	29.7057	30.9694	32.0013	(42b)
Hot water usage for other uses	45.2686	43.6225	41.9764	40.3302	38.6841	37.0380	37.0380	38.6841	40.3302	41.9764	43.6225	45.2686	(42c)

Average daily hot water use (litres/day) 139.5018 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.7604	148.5196	144.5730	138.5721	133.6989	128.4598	126.4467	130.3762	134.5204	140.0205	146.1139	151.3669	(44)
Energy conte	240.3514	211.4899	222.2034	189.6983	179.9844	157.9564	152.9263	161.4329	165.8771	190.0065	208.1660	237.0039	(45)

Energy content (annual) Total = Sum(45)m = 2317.0966

Distribution loss (46)m = 0.15 x (45)m	36.0527	31.7235	33.3305	28.4547	26.9977	23.6935	22.9389	24.2149	24.8816	28.5010	31.2249	35.5506	(46)

Water storage loss:
Store volume 250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 1.0800 (55)

Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.8314	241.7299	255.6834	222.0983	213.4644	190.3564	186.4063	194.9129	198.2771	223.4865	240.5660	270.4839	(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	273.8314	241.7299	255.6834	222.0983	213.4644	190.3564	186.4063	194.9129	198.2771	223.4865	240.5660	270.4839	(64)

Total per year (kWh/year) = Sum(64)m = 2711.2966 (64)
12Total per year (kWh/year) 2711 (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	106.7008	94.5124	100.6666	88.9947	86.6288	78.4405	77.6320	80.4605	81.0741	89.9612	95.1352	105.5878	(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	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	198.0320	219.2497	198.0320	204.6331	198.0320	204.6331	198.0320	198.0320	204.6331	198.0320	204.6331	198.0320	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	363.5707	367.3435	357.8363	337.5967	312.0479	288.0355	271.9938	268.2211	277.7283	297.9679	323.5167	347.5290	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	(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)	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	(71)
Water heating gains (Table 5)	143.4151	140.6434	135.3046	123.6037	116.4366	108.9451	104.3441	108.1458	112.6030	120.9155	132.1322	141.9191	(72)
Total internal gains	772.8943	795.1131	759.0494	733.7100	694.3929	669.4902	642.2464	642.2754	662.8408	684.7919	728.1585	755.3566	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	10.2500	10.6334	0.7200	0.7000	0.7700	38.0679	(74)
East	2.0700	19.6403	0.7200	0.7000	0.7700	14.1998	(76)
South	12.4100	46.7521	0.7200	0.7000	0.7700	202.6452	(78)
West	1.3800	19.6403	0.7200	0.7000	0.7700	9.4665	(80)

Solar gains	264.3795	450.9267	622.6201	787.5686	901.6652	905.0184	868.3306	780.8492	678.9248	499.4980	316.6745	226.3014	(83)
Total gains	1037.2738	1246.0398	1381.6695	1521.2786	1596.0582	1574.5086	1510.5770	1423.1245	1341.7656	1184.2899	1044.8329	981.6580	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.2458	52.3122	52.3773	52.6856	52.7436	53.0157	53.0157	53.0664	52.9106	52.7436	52.6263	52.5042	
alpha	4.4831	4.4875	4.4918	4.5124	4.5162	4.5344	4.5344	4.5378	4.5274	4.5162	4.5084	4.5003	
util living area	0.9949	0.9880	0.9740	0.9336	0.8425	0.6775	0.5140	0.5630	0.7902	0.9515	0.9892	0.9960	(86)
MIT	19.4695	19.7040	20.0128	20.4081	20.7366	20.9294	20.9839	20.9758	20.8545	20.4223	19.8690	19.4246	(87)
Th 2	20.1190	20.1200	20.1210	20.1257	20.1266	20.1307	20.1307	20.1314	20.1291	20.1266	20.1248	20.1229	(88)
util rest of house	0.9937	0.9851	0.9676	0.9166	0.8027	0.6044	0.4188	0.4664	0.7277	0.9358	0.9861	0.9950	(89)
MIT 2	18.3099	18.6092	19.0010	19.4952	19.8808	20.0811	20.1234	20.1196	20.0141	19.5207	18.8245	18.2553	(90)
Living area fraction										fLA = Living area / (4) =		0.1494	(91)
MIT	18.4831	18.7728	19.1522	19.6316	20.0086	20.2078	20.2519	20.2475	20.1397	19.6554	18.9805	18.4299	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4831	18.7728	19.1522	19.6316	20.0086	20.2078	20.2519	20.2475	20.1397	19.6554	18.9805	18.4299	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9903	0.9790	0.9583	0.9050	0.7966	0.6113	0.4325	0.4798	0.7285	0.9249	0.9804	0.9923	(94)
Useful gains	1027.2235	1219.8869	1324.0257	1376.7034	1271.4202	962.4728	653.3026	682.8205	977.5128	1095.3381	1024.4005	974.0590	(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	2609.8773	2549.5367	2322.3235	1958.2659	1514.4684	1016.9295	662.2377	697.0365	1097.4182	1650.5854	2170.3733	2605.6143	(97)
Space heating kWh	1177.4945	893.5247	742.7336	418.7250	180.8279	0.0000	0.0000	0.0000	0.0000	413.1040	825.1004	1213.8772	(98a)
Space heating requirement - total per year (kWh/year)												5865.3872	
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	1177.4945	893.5247	742.7336	418.7250	180.8279	0.0000	0.0000	0.0000	0.0000	413.1040	825.1004	1213.8772	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5865.3872	
Space heating per m2											(98c) / (4) =	30.5171	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1177.4945	893.5247	742.7336	418.7250	180.8279	0.0000	0.0000	0.0000	0.0000	413.1040	825.1004	1213.8772	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	1177.4945	893.5247	742.7336	418.7250	180.8279	0.0000	0.0000	0.0000	0.0000	413.1040	825.1004	1213.8772	(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	273.8314	241.7299	255.6834	222.0983	213.4644	190.3564	186.4063	194.9129	198.2771	223.4865	240.5660	270.4839	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month	273.8314	241.7299	255.6834	222.0983	213.4644	190.3564	186.4063	194.9129	198.2771	223.4865	240.5660	270.4839	(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	51.0094	40.9216	36.8454	26.9945	20.8513	17.0357	19.0213	24.7246	32.1148	42.1364	47.5929	52.4271	(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	5865.3872	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	100.0000	
Water heating fuel used	2711.2966	(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)	411.6752	(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	8988.3590	(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	5865.3872	0.1553	910.9150	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2711.2966	0.1412	382.7307	(264)
Space and water heating			1293.6457	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	411.6752	0.1443	59.4175	(268)
Total CO2, kg/year			1353.0631	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.0400	(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	5865.3872	1.5750	9237.7514	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2711.2966	1.5220	4126.5309	(278)
Space and water heating			13364.2823	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	411.6752	1.5338	631.4412	(282)
Total Primary energy kWh/year			13995.7235	(286)
Dwelling Primary energy Rate (DPER)			72.8200	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	103.8800	(1b)	x 2.4000	(2b) =	249.3120	(1b) - (3b)
First floor	88.3200	(1c)	x 2.6000	(2c) =	229.6320	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	192.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		478.9440	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0835	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3335	(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) =	0.2835	(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	0.3614	0.3544	0.3473	0.3118	0.3048	0.2693	0.2693	0.2622	0.2835	0.3048	0.3189	0.3331	(22b)
Effective ac	0.5653	0.5628	0.5603	0.5486	0.5464	0.5363	0.5363	0.5344	0.5402	0.5464	0.5509	0.5555	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K

TER Opaque door			5.8500	1.0000	5.8500	(26)
TER Opening Type (Uw = 1.20)			26.1100	1.1450	29.8969	(27)
Heatloss Floor 1			103.8800	0.1300	13.5044	(28a)
External Wall 1	221.1500	31.9600	189.1900	0.1800	34.0542	(29a)
main	88.3200		88.3200	0.1100	9.7152	(30)
over gf	15.5600		15.5600	0.1100	1.7116	(30)
Total net area of external elements Aum(A, m2)			428.9100			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		94.7323	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 180.0735 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	46.9100	0.1600	7.5056
E16 Corner (normal)	24.8000	0.0900	2.2320
E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0900	-0.4320
E12 Gable (insulation at ceiling level)	16.1600	0.0600	0.9696
E10 Eaves (insulation at ceiling level)	34.7600	0.0600	2.0856
E2 Other lintels (including other steel lintels)	24.1500	0.0500	1.2075
E3 Sill	21.3600	0.0500	1.0680
E4 Jamb	53.9000	0.0500	2.6950
E6 Intermediate floor within a dwelling	28.6800	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	10.3000	0.2400	2.4720

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.8033 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 114.5356 (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	89.3501	88.9492	88.5562	86.7105	86.3651	84.7575	84.7575	84.4598	85.3768	86.3651	87.0638	87.7941	(38)
Heat transfer coeff	203.8858	203.4849	203.0919	201.2461	200.9008	199.2932	199.2932	198.9955	199.9124	200.9008	201.5994	202.3298	(39)
Average = Sum(39)m / 12 =												201.2445	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0608	1.0587	1.0567	1.0471	1.0453	1.0369	1.0369	1.0354	1.0401	1.0453	1.0489	1.0527	(40)
HLP (average)												1.0471	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9918 (42)

Hot water usage for mixer showers

74.3819	73.2641	71.6352	68.5186	66.2187	63.6538	62.1959	63.8125	65.5845	68.3384	71.5219	74.0969	(42a)

Hot water usage for baths

32.1099	31.6330	30.9614	29.7232	28.7961	27.7680	27.2127	27.8796	28.6056	29.7057	30.9694	32.0013	(42b)

Hot water usage for other uses

45.2686	43.6225	41.9764	40.3302	38.6841	37.0380	37.0380	38.6841	40.3302	41.9764	43.6225	45.2686	(42c)

Average daily hot water use (litres/day) 139.5018 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.7604	148.5196	144.5730	138.5721	133.6989	128.4598	126.4467	130.3762	134.5204	140.0205	146.1139	151.3669	(44)
Energy conte	240.3514	211.4899	222.2034	189.6983	179.9844	157.9564	152.9263	161.4329	165.8771	190.0065	208.1660	237.0039	(45)
Energy content (annual)										Total = Sum(45)m =		2317.0966	
Distribution loss (46)m = 0.15 x (45)m	36.0527	31.7235	33.3305	28.4547	26.9977	23.6935	22.9389	24.2149	24.8816	28.5010	31.2249	35.5506	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0208	(55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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	295.2582	261.0831	277.1102	242.8339	234.8912	211.0920	207.8331	216.3397	219.0127	244.9133	261.3016	291.9107	(62)
WWHRS	-34.0043	-30.0737	-31.4914	-26.0761	-24.3020	-20.7954	-19.4924	-20.7282	-21.5157	-25.3647	-28.7351	-33.3746	(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	261.2539	231.0095	245.6187	216.7578	210.5892	190.2965	188.3407	195.6115	197.4970	219.5486	232.5665	258.5361	(64)
									Total per year (kWh/year) = Sum(64)m =			2647.6260	(64)
12Total per year (kWh/year)												2648	(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	123.8423	109.9950	117.8081	105.5832	103.7703	95.0290	94.7734	97.6019	97.6626	107.1026	111.7237	122.7292	(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	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	198.0320	219.2497	198.0320	204.6331	198.0320	204.6331	198.0320	198.0320	204.6331	198.0320	204.6331	198.0320	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	363.5707	367.3435	357.8363	337.5967	312.0479	288.0355	271.9938	268.2211	277.7283	297.9679	323.5167	347.5290	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	(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)	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	(71)
Water heating gains (Table 5)	166.4547	163.6830	158.3442	146.6433	139.4762	131.9847	127.3836	131.1853	135.6425	143.9551	155.1718	164.9587	(72)
Total internal gains	798.9339	821.1527	785.0889	759.7496	720.4325	692.5298	665.2859	665.3149	685.8803	710.8314	754.1980	781.3962	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	10.2500	10.6334	0.6300	0.7000	0.7700	33.3095	(74)
East	2.0700	19.6403	0.6300	0.7000	0.7700	12.4248	(76)
South	12.4100	46.7521	0.6300	0.7000	0.7700	177.3146	(78)
West	1.3800	19.6403	0.6300	0.7000	0.7700	8.2832	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	231.3320	394.5609	544.7926	689.1225	788.9571	791.8911	759.7893	683.2430	594.0592	437.0607	277.0902	198.0138	(83)
Total gains	1030.2659	1215.7135	1329.8816	1448.8721	1509.3896	1484.4209	1425.0752	1348.5579	1279.9395	1147.8922	1031.2882	979.4099	(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	47.1535	47.2464	47.3378	47.7720	47.8541	48.2401	48.2401	48.3123	48.0907	47.8541	47.6882	47.5161	
alpha	4.1436	4.1498	4.1559	4.1848	4.1903	4.2160	4.2160	4.2208	4.2060	4.1903	4.1792	4.1677	
util living area	0.9951	0.9897	0.9795	0.9505	0.8826	0.7426	0.5821	0.6298	0.8369	0.9617	0.9903	0.9960	(86)
MIT	19.2596	19.4832	19.7978	20.2238	20.6065	20.8726	20.9652	20.9514	20.7735	20.2766	19.6938	19.2241	(87)
Th 2	20.0330	20.0347	20.0364	20.0443	20.0458	20.0527	20.0527	20.0540	20.0500	20.0458	20.0428	20.0396	(88)
util rest of house	0.9938	0.9871	0.9741	0.9365	0.8472	0.6665	0.4710	0.5201	0.7772	0.9481	0.9874	0.9950	(89)
MIT 2	17.9836	18.2699	18.6709	19.2103	19.6710	19.9609	20.0367	20.0297	19.8664	19.2834	18.5455	17.9426	(90)
Living area fraction									fLA = Living area / (4) =			0.1494	(91)
MIT	18.1742	18.4511	18.8392	19.3617	19.8108	20.0971	20.1754	20.1674	20.0019	19.4318	18.7170	18.1340	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1742	18.4511	18.8392	19.3617	19.8108	20.0971	20.1754	20.1674	20.0019	19.4318	18.7170	18.1340	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9903	0.9810	0.9649	0.9237	0.8369	0.6704	0.4862	0.5342	0.7737	0.9364	0.9816	0.9920	(94)
Useful gains	1020.2402	1192.6562	1283.2575	1338.3879	1263.2288	995.2221	692.8552	720.3911	990.2623	1074.9329	1012.2820	971.5802	(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	2828.7581	2757.4513	2505.9975	2105.3714	1629.4581	1095.5247	712.5582	749.6882	1179.8624	1774.3149	2341.9886	2819.2696	(97)
Space heating kWh	1345.5373	1051.5423	909.7185	552.2282	272.4746	0.0000	0.0000	0.0000	0.0000	520.3402	957.3887	1374.6809	(98a)
Space heating requirement - total per year (kWh/year)												6983.9107	
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	1345.5373	1051.5423	909.7185	552.2282	272.4746	0.0000	0.0000	0.0000	0.0000	520.3402	957.3887	1374.6809	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6983.9107	
Space heating per m2											(98c) / (4) =	36.3367	(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	1345.5373	1051.5423	909.7185	552.2282	272.4746	0.0000	0.0000	0.0000	0.0000	520.3402	957.3887	1374.6809	(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)	1457.7869	1139.2657	985.6105	598.2970	295.2054	0.0000	0.0000	0.0000	0.0000	563.7489	1037.2575	1489.3618	(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	261.2539	231.0095	245.6187	216.7578	210.5892	190.2965	188.3407	195.6115	197.4970	219.5486	232.5665	258.5361	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2009	87.0320	86.7207	86.0640	84.6386	79.8000	79.8000	79.8000	79.8000	85.9245	86.8849	87.2424	(217)
Fuel for water heating, kWh/month	299.5998	265.4304	283.2296	251.8565	248.8099	238.4668	236.0159	245.1272	247.4900	255.5136	267.6720	296.3422	(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	41.1471	33.0098	29.7216	21.7753	16.8199	13.7420	15.3437	19.9443	25.9057	33.9896	38.3912	42.2907	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-85.4597	-114.9311	-157.5771	-168.5876	-174.6777	-160.3353	-158.1173	-152.5368	-141.9586	-127.0036	-91.8559	-74.5324	(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	-66.6411	-137.6058	-268.9947	-397.7692	-520.2115	-520.8404	-514.9096	-438.7254	-325.1467	-194.8869	-88.3090	-52.9159	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											7566.5338	(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											3135.5539	(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)											332.0810	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-5134.5293	(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											5985.6395	(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	7566.5338	0.2100	1588.9721	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3135.5539	0.2100	658.4663	(264)
Space and water heating			2247.4384	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	332.0810	0.1443	47.9296	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1607.5731	0.1357	-218.0795	
PV Unit electricity exported	-3526.9562	0.1264	-445.6382	
Total			-663.7177	(269)
Total CO2, kg/year			1643.5795	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.5500	(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	7566.5338	1.1300	8550.1832	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3135.5539	1.1300	3543.1760	(278)
Space and water heating			12093.3592	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	332.0810	1.5338	509.3570	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1607.5731	1.5014	-2413.6533	
PV Unit electricity exported	-3526.9562	0.4638	-1635.8678	
Total			-4049.5211	(283)
Total Primary energy kWh/year			8683.2959	(286)
Target Primary Energy Rate (TPER)			45.1800	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 7	Assessment Date	27/09/2024
Property Type/Built Form	Pre renewable	Date of Test	
Address	Plot 7 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

SAP Rating	64 D	DER	7.15	TER	8.70
Environment	92 A	% DER < TER			17.82
CO2 Emissions (Tonnes)	1.15	DFEE	34.82	TFEE	41.46
Compliance Check	See BREL	% DFEE < TFEE			16.03
Assessor's Name	-60.86	DPER	73.93	TPER	45.96

Assessor Name	Mr. Neil Rothon	Accreditation	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	103.8800 (1b)	x	2.4000 (2b)	=	249.3120	(1b) - (3b)
First floor	88.3200 (1c)	x	2.6000 (2c)	=	229.6320	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	192.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	478.9440	(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	5 * 10 =	50.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) =	0.1044	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2544	(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) =	0.2162	(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	0.2757	0.2703	0.2649	0.2379	0.2325	0.2054	0.2054	0.2000	0.2162	0.2325	0.2433	0.2541	(22b)
Effective ac	0.5380	0.5365	0.5351	0.5283	0.5270	0.5211	0.5211	0.5200	0.5234	0.5270	0.5296	0.5323	(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	
Front door			1.9500	1.2000	2.3400			(26)
side door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			26.1100	1.1450	29.8969			(27)
to garage			1.9500	1.4000	2.7300			(26)
Heatloss Floor 1			103.8800	0.1000	10.3880	75.0000	7791.0000	(28a)
External Wall 1	221.1500	31.9600	189.1900	0.1500	28.3785	110.0000	20810.9000	(29a)
main	88.3200		88.3200	0.1200	10.5984	9.0000	794.8800	(30)
over gf	15.5600		15.5600	0.1200	1.8672	9.0000	140.0400	(30)
Total net area of external elements Aum(A, m2)			428.9100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.5390			(33)
Internal Wall 1			298.7400			9.0000	2688.6600	(32c)
Internal Floor 1			88.3200			18.0000	1589.7600	(32d)
Internal Ceiling 1			88.3200			9.0000	794.8800	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		34610.1200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							180.0735	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	46.9100	0.0590	2.7677

E16 Corner (normal)	24.8000	0.0350	0.8680	
E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0660	-0.3168	
E12 Gable (insulation at ceiling level)	16.1600	0.0410	0.6626	
E10 Eaves (insulation at ceiling level)	34.7600	0.0640	2.2246	
E2 Other lintels (including other steel lintels)	24.1500	0.0310	0.7486	
E3 Sill	21.3600	0.0290	0.6194	
E4 Jamb	53.9000	0.0240	1.2936	
E6 Intermediate floor within a dwelling	28.6800	0.0010	0.0287	
E24 Eaves (insulation at ceiling level - inverted)	10.3000	0.1500	1.5450	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4415 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 98.9805 (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	85.0326	84.7994	84.5707	83.4969	83.2959	82.3606	82.3606	82.1874	82.7209	83.2959	83.7024	84.1273	(38)
Heat transfer coeff	184.0131	183.7799	183.5513	182.4774	182.2764	181.3411	181.3411	181.1679	181.7014	182.2764	182.6829	183.1078	(39)

Average = Sum(39)m / 12 = 182.4764

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9574	0.9562	0.9550	0.9494	0.9484	0.9435	0.9435	0.9426	0.9454	0.9484	0.9505	0.9527	(40)
HLP (average)												0.9494	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9918 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	74.3819	73.2641	71.6352	68.5186	66.2187	63.6538	62.1959	63.8125	65.5845	68.3384	71.5219	74.0969	(42a)
Hot water usage for baths	32.1099	31.6330	30.9614	29.7232	28.7961	27.7680	27.2127	27.8796	28.6056	29.7057	30.9694	32.0013	(42b)
Hot water usage for other uses	45.2686	43.6225	41.9764	40.3302	38.6841	37.0380	37.0380	38.6841	40.3302	41.9764	43.6225	45.2686	(42c)

Average daily hot water use (litres/day) 139.5018 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.7604	148.5196	144.5730	138.5721	133.6989	128.4598	126.4467	130.3762	134.5204	140.0205	146.1139	151.3669	(44)
Energy conte	240.3514	211.4899	222.2034	189.6983	179.9844	157.9564	152.9263	161.4329	165.8771	190.0065	208.1660	237.0039	(45)

Energy content (annual) Total = Sum(45)m = 2317.0966

Distribution loss (46)m = 0.15 x (45)m	36.0527	31.7235	33.3305	28.4547	26.9977	23.6935	22.9389	24.2149	24.8816	28.5010	31.2249	35.5506	(46)

Water storage loss:
Store volume 250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.6000 (49)
Enter (49) or (54) in (55) 1.0800 (55)

Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	273.8314	241.7299	255.6834	222.0983	213.4644	190.3564	186.4063	194.9129	198.2771	223.4865	240.5660	270.4839	(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	273.8314	241.7299	255.6834	222.0983	213.4644	190.3564	186.4063	194.9129	198.2771	223.4865	240.5660	270.4839	(64)

Total per year (kWh/year) = Sum(64)m = 2711.2966 (64)
12Total per year (kWh/year) 2711 (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	106.7008	94.5124	100.6666	88.9947	86.6288	78.4405	77.6320	80.4605	81.0741	89.9612	95.1352	105.5878	(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	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	198.0320	219.2497	198.0320	204.6331	198.0320	204.6331	198.0320	198.0320	204.6331	198.0320	204.6331	198.0320	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	363.5707	367.3435	357.8363	337.5967	312.0479	288.0355	271.9938	268.2211	277.7283	297.9679	323.5167	347.5290	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	(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)	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	(71)
Water heating gains (Table 5)	143.4151	140.6434	135.3046	123.6037	116.4366	108.9451	104.3441	108.1458	112.6030	120.9155	132.1322	141.9191	(72)
Total internal gains	772.8943	795.1131	759.0494	733.7100	694.3929	669.4902	642.2464	642.2754	662.8408	684.7919	728.1585	755.3566	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	12.4100	10.6334	0.7200	0.7000	0.7700	46.0901	(74)
East	2.0700	19.6403	0.7200	0.7000	0.7700	14.1998	(76)
South	10.2500	46.7521	0.7200	0.7000	0.7700	167.3742	(78)
West	1.3800	19.6403	0.7200	0.7000	0.7700	9.4665	(80)

Solar gains	237.1305	408.4925	575.0885	746.2487	871.3709	881.9613	843.1815	746.4109	633.3807	455.4423	284.7626	202.5117	(83)
Total gains	1010.0248	1203.6056	1334.1379	1479.9587	1565.7639	1551.4515	1485.4279	1388.6863	1296.2215	1140.2342	1012.9210	957.8683	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.2458	52.3122	52.3773	52.6856	52.7436	53.0157	53.0157	53.0664	52.9106	52.7436	52.6263	52.5042	
alpha	4.4831	4.4875	4.4918	4.5124	4.5162	4.5344	4.5344	4.5378	4.5274	4.5162	4.5084	4.5003	
util living area	0.9954	0.9894	0.9771	0.9391	0.8496	0.6848	0.5218	0.5750	0.8052	0.9573	0.9904	0.9964	(86)
MIT	19.4496	19.6739	19.9811	20.3853	20.7258	20.9262	20.9829	20.9737	20.8420	20.3957	19.8462	19.4071	(87)
Th 2	20.1190	20.1200	20.1210	20.1257	20.1266	20.1307	20.1307	20.1314	20.1291	20.1266	20.1248	20.1229	(88)
util rest of house	0.9943	0.9869	0.9713	0.9232	0.8108	0.6117	0.4256	0.4771	0.7442	0.9430	0.9877	0.9955	(89)
MIT 2	18.2844	18.5711	18.9616	19.4680	19.8696	20.0787	20.1229	20.1184	20.0029	19.4890	18.7957	18.2329	(90)
Living area fraction										fLA = Living area / (4) =		0.1494	(91)
MIT	18.4585	18.7359	19.1139	19.6051	19.9975	20.2053	20.2513	20.2462	20.1282	19.6244	18.9526	18.4083	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4585	18.7359	19.1139	19.6051	19.9975	20.2053	20.2513	20.2462	20.1282	19.6244	18.9526	18.4083	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9912	0.9813	0.9626	0.9116	0.8043	0.6184	0.4393	0.4906	0.7442	0.9324	0.9824	0.9929	(94)
Useful gains	1001.1369	1181.1350	1284.1882	1349.1136	1259.2668	959.4560	652.6183	681.2760	964.5887	1063.1787	995.1048	951.0946	(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	2605.3476	2542.7512	2315.2924	1953.4308	1512.4366	1016.4668	662.1354	696.8053	1095.3341	1644.9375	2165.2725	2601.6503	(97)
Space heating kWh	1193.5327	915.0061	767.1415	435.1084	188.3584	0.0000	0.0000	0.0000	0.0000	432.8285	842.5208	1228.0135	(98a)
Space heating requirement - total per year (kWh/year)												6002.5098	
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	1193.5327	915.0061	767.1415	435.1084	188.3584	0.0000	0.0000	0.0000	0.0000	432.8285	842.5208	1228.0135	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6002.5098	
Space heating per m2											(98c) / (4) =	31.2305	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1193.5327	915.0061	767.1415	435.1084	188.3584	0.0000	0.0000	0.0000	0.0000	432.8285	842.5208	1228.0135	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	1193.5327	915.0061	767.1415	435.1084	188.3584	0.0000	0.0000	0.0000	0.0000	432.8285	842.5208	1228.0135	(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	273.8314	241.7299	255.6834	222.0983	213.4644	190.3564	186.4063	194.9129	198.2771	223.4865	240.5660	270.4839	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month	273.8314	241.7299	255.6834	222.0983	213.4644	190.3564	186.4063	194.9129	198.2771	223.4865	240.5660	270.4839	(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	51.0094	40.9216	36.8454	26.9945	20.8513	17.0357	19.0213	24.7246	32.1148	42.1364	47.5929	52.4271	(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	6002.5098	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	100.0000	
Water heating fuel used	2711.2966	(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)	411.6752	(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	9125.4816	(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	6002.5098	0.1552	931.6548	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2711.2966	0.1412	382.7307	(264)
Space and water heating			1314.3854	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	411.6752	0.1443	59.4175	(268)
Total CO2, kg/year			1373.8029	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.1500	(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	6002.5098	1.5746	9451.6817	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2711.2966	1.5220	4126.5309	(278)
Space and water heating			13578.2126	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	411.6752	1.5338	631.4412	(282)
Total Primary energy kWh/year			14209.6538	(286)
Dwelling Primary energy Rate (DPER)			73.9300	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	103.8800	(1b)	x 2.4000	(2b) =	249.3120	(1b) - (3b)
First floor	88.3200	(1c)	x 2.6000	(2c) =	229.6320	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	192.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		478.9440	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0835	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3335	(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) =	0.2835	(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	0.3614	0.3544	0.3473	0.3118	0.3048	0.2693	0.2693	0.2622	0.2835	0.3048	0.3189	0.3331	(22b)
Effective ac	0.5653	0.5628	0.5603	0.5486	0.5464	0.5363	0.5363	0.5344	0.5402	0.5464	0.5509	0.5555	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K

TER Opaque door			5.8500	1.0000	5.8500	(26)
TER Opening Type (Uw = 1.20)			26.1100	1.1450	29.8969	(27)
Heatloss Floor 1			103.8800	0.1300	13.5044	(28a)
External Wall 1	221.1500	31.9600	189.1900	0.1800	34.0542	(29a)
main	88.3200		88.3200	0.1100	9.7152	(30)
over gf	15.5600		15.5600	0.1100	1.7116	(30)
Total net area of external elements Aum(A, m2)			428.9100			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		94.7323	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 180.0735 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	46.9100	0.1600	7.5056
E16 Corner (normal)	24.8000	0.0900	2.2320
E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0900	-0.4320
E12 Gable (insulation at ceiling level)	16.1600	0.0600	0.9696
E10 Eaves (insulation at ceiling level)	34.7600	0.0600	2.0856
E2 Other lintels (including other steel lintels)	24.1500	0.0500	1.2075
E3 Sill	21.3600	0.0500	1.0680
E4 Jamb	53.9000	0.0500	2.6950
E6 Intermediate floor within a dwelling	28.6800	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	10.3000	0.2400	2.4720

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.8033 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 114.5356 (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	89.3501	88.9492	88.5562	86.7105	86.3651	84.7575	84.7575	84.4598	85.3768	86.3651	87.0638	87.7941	(38)
Heat transfer coeff	203.8858	203.4849	203.0919	201.2461	200.9008	199.2932	199.2932	198.9955	199.9124	200.9008	201.5994	202.3298	(39)
Average = Sum(39)m / 12 =												201.2445	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0608	1.0587	1.0567	1.0471	1.0453	1.0369	1.0369	1.0354	1.0401	1.0453	1.0489	1.0527	(40)
HLP (average)												1.0471	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9918 (42)

Hot water usage for mixer showers

74.3819	73.2641	71.6352	68.5186	66.2187	63.6538	62.1959	63.8125	65.5845	68.3384	71.5219	74.0969	(42a)

Hot water usage for baths

32.1099	31.6330	30.9614	29.7232	28.7961	27.7680	27.2127	27.8796	28.6056	29.7057	30.9694	32.0013	(42b)

Hot water usage for other uses

45.2686	43.6225	41.9764	40.3302	38.6841	37.0380	37.0380	38.6841	40.3302	41.9764	43.6225	45.2686	(42c)

Average daily hot water use (litres/day) 139.5018 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.7604	148.5196	144.5730	138.5721	133.6989	128.4598	126.4467	130.3762	134.5204	140.0205	146.1139	151.3669	(44)
Energy conte	240.3514	211.4899	222.2034	189.6983	179.9844	157.9564	152.9263	161.4329	165.8771	190.0065	208.1660	237.0039	(45)
Energy content (annual)										Total = Sum(45)m =		2317.0966	
Distribution loss (46)m = 0.15 x (45)m	36.0527	31.7235	33.3305	28.4547	26.9977	23.6935	22.9389	24.2149	24.8816	28.5010	31.2249	35.5506	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0208	(55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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	295.2582	261.0831	277.1102	242.8339	234.8912	211.0920	207.8331	216.3397	219.0127	244.9133	261.3016	291.9107	(62)
WWHRS	-34.0043	-30.0737	-31.4914	-26.0761	-24.3020	-20.7954	-19.4924	-20.7282	-21.5157	-25.3647	-28.7351	-33.3746	(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	261.2539	231.0095	245.6187	216.7578	210.5892	190.2965	188.3407	195.6115	197.4970	219.5486	232.5665	258.5361	(64)
									Total per year (kWh/year) = Sum(64)m =			2647.6260	(64)
12Total per year (kWh/year)												2648	(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	123.8423	109.9950	117.8081	105.5832	103.7703	95.0290	94.7734	97.6019	97.6626	107.1026	111.7237	122.7292	(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	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	198.0320	219.2497	198.0320	204.6331	198.0320	204.6331	198.0320	198.0320	204.6331	198.0320	204.6331	198.0320	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	363.5707	367.3435	357.8363	337.5967	312.0479	288.0355	271.9938	268.2211	277.7283	297.9679	323.5167	347.5290	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	(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)	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	(71)
Water heating gains (Table 5)	166.4547	163.6830	158.3442	146.6433	139.4762	131.9847	127.3836	131.1853	135.6425	143.9551	155.1718	164.9587	(72)
Total internal gains	798.9339	821.1527	785.0889	759.7496	720.4325	692.5298	665.2859	665.3149	685.8803	710.8314	754.1980	781.3962	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	12.4100	10.6334	0.6300	0.7000	0.7700	40.3288	(74)
East	2.0700	19.6403	0.6300	0.7000	0.7700	12.4248	(76)
South	10.2500	46.7521	0.6300	0.7000	0.7700	146.4524	(78)
West	1.3800	19.6403	0.6300	0.7000	0.7700	8.2832	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	207.4892	357.4310	503.2024	652.9676	762.4496	771.7162	737.7838	653.1096	554.2081	398.5120	249.1673	177.1977	(83)
Total gains	1006.4231	1178.5836	1288.2914	1412.7171	1482.8821	1464.2459	1403.0698	1318.4245	1240.0885	1109.3435	1003.3653	958.5939	(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	47.1535	47.2464	47.3378	47.7720	47.8541	48.2401	48.2401	48.3123	48.0907	47.8541	47.6882	47.5161	
alpha	4.1436	4.1498	4.1559	4.1848	4.1903	4.2160	4.2160	4.2208	4.2060	4.1903	4.1792	4.1677	
util living area	0.9955	0.9908	0.9816	0.9543	0.8879	0.7488	0.5896	0.6408	0.8483	0.9657	0.9912	0.9963	(86)
MIT	19.2426	19.4573	19.7700	20.2025	20.5950	20.8683	20.9635	20.9481	20.7594	20.2527	19.6742	19.2091	(87)
Th 2	20.0330	20.0347	20.0364	20.0443	20.0458	20.0527	20.0527	20.0540	20.0500	20.0458	20.0428	20.0396	(88)
util rest of house	0.9944	0.9885	0.9768	0.9411	0.8534	0.6732	0.4777	0.5305	0.7907	0.9533	0.9886	0.9954	(89)
MIT 2	17.9619	18.2370	18.6360	19.1845	19.6585	19.9573	20.0359	20.0278	19.8530	19.2545	18.5207	17.9235	(90)
Living area fraction									fLA = Living area / (4) =			0.1494	(91)
MIT	18.1532	18.4193	18.8054	19.3366	19.7984	20.0934	20.1744	20.1653	19.9884	19.4036	18.6930	18.1155	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1532	18.4193	18.8054	19.3366	19.7984	20.0934	20.1744	20.1653	19.9884	19.4036	18.6930	18.1155	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9910	0.9828	0.9681	0.9286	0.8428	0.6768	0.4929	0.5445	0.7863	0.9421	0.9831	0.9926	(94)
Useful gains	997.3732	1158.3366	1247.1895	1311.8351	1249.8017	990.9342	691.6284	717.8497	975.0998	1045.0643	986.4368	951.4761	(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	2824.4658	2750.9642	2499.1263	2100.3211	1626.9788	1094.8007	712.3611	749.2774	1177.1621	1768.6438	2337.1397	2815.5249	(97)
Space heating kWh	1359.3569	1070.2458	931.4410	567.7099	280.6197	0.0000	0.0000	0.0000	0.0000	538.3431	972.5062	1386.8523	(98a)
Space heating requirement - total per year (kWh/year)												7107.0749	
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	1359.3569	1070.2458	931.4410	567.7099	280.6197	0.0000	0.0000	0.0000	0.0000	538.3431	972.5062	1386.8523	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7107.0749	
Space heating per m2											(98c) / (4) =	36.9775	(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	1359.3569	1070.2458	931.4410	567.7099	280.6197	0.0000	0.0000	0.0000	0.0000	538.3431	972.5062	1386.8523	(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)	1472.7594	1159.5295	1009.1452	615.0703	304.0301	0.0000	0.0000	0.0000	0.0000	583.2537	1053.6361	1502.5486	(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	261.2539	231.0095	245.6187	216.7578	210.5892	190.2965	188.3407	195.6115	197.4970	219.5486	232.5665	258.5361	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2143	87.0569	86.7582	86.1164	84.7044	79.8000	79.8000	79.8000	79.8000	85.9906	86.9084	87.2538	(217)
Fuel for water heating, kWh/month	299.5538	265.3544	283.1072	251.7034	248.6165	238.4668	236.0159	245.1272	247.4900	255.3170	267.5996	296.3037	(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	41.1471	33.0098	29.7216	21.7753	16.8199	13.7420	15.3437	19.9443	25.9057	33.9896	38.3912	42.2907	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-85.4597	-114.9311	-157.5771	-168.5876	-174.6777	-160.3353	-158.1173	-152.5368	-141.9586	-127.0036	-91.8559	-74.5324	(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	-66.6411	-137.6058	-268.9947	-397.7692	-520.2115	-520.8404	-514.9096	-438.7254	-325.1467	-194.8869	-88.3090	-52.9159	(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	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											7699.9728	(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											3134.6557	(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)											332.0810	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-5134.5293	(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											6118.1803	(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	7699.9728	0.2100	1616.9943	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3134.6557	0.2100	658.2777	(264)
Space and water heating			2275.2720	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	332.0810	0.1443	47.9296	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1607.5731	0.1357	-218.0795	
PV Unit electricity exported	-3526.9562	0.1264	-445.6382	
Total			-663.7177	(269)
Total CO2, kg/year			1671.4131	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.7000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	7699.9728	1.1300	8700.9693	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3134.6557	1.1300	3542.1609	(278)
Space and water heating			12243.1302	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	332.0810	1.5338	509.3570	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1607.5731	1.5014	-2413.6533	
PV Unit electricity exported	-3526.9562	0.4638	-1635.8678	
Total			-4049.5211	(283)
Total Primary energy kWh/year			8833.0669	(286)
Target Primary Energy Rate (TPER)			45.9600	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 8	Assessment Date	27/09/2024
Property Type Details	Pre renewable	Date of Test	
Address	Plot 8 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

EI Rating	62 D	DER	7.78	TER	9.66
Environment	92 A	% DER < TER			19.46
CO2 Emissions (tonnes)	1.13	DFEE	37.89	TFEE	44.51
Compliance Check	See BREL	% DFEE < TFEE			14.86
Spare 1 Name	-58.16	Spare 1	80.57	Spare 1	50.94

Assessor Name	Mr. Neil Rothon	Assessor ID	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	93.2800 (1b)	x	2.4000 (2b)	=	223.8720	(1b) - (3b)
First floor	78.6500 (1c)	x	2.6000 (2c)	=	204.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.9300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	428.3620	(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	5 * 10 =	50.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) =	0.1167	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2667	(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) =	0.2267	(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	0.2891	0.2834	0.2777	0.2494	0.2437	0.2154	0.2154	0.2097	0.2267	0.2437	0.2551	0.2664	(22b)
Effective ac	0.5418	0.5402	0.5386	0.5311	0.5297	0.5232	0.5232	0.5220	0.5257	0.5297	0.5325	0.5355	(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	
Front door			1.9500	1.2000	2.3400			(26)
side door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			27.1500	1.1450	31.0878			(27)
Heatloss Floor 1			93.2800	0.1000	9.3280	75.0000	6996.0000	(28a)
External Wall 1	194.9100	31.0500	163.8600	0.1500	24.5790	110.0000	18024.6000	(29a)
main	78.6500		78.6500	0.1200	9.4380	9.0000	707.8500	(30)
over gf	14.6300		14.6300	0.1200	1.7556	9.0000	131.6700	(30)
Total net area of external elements Aum(A, m2)			381.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		80.8684			(33)
Internal Wall 1			278.0000			9.0000	2502.0000	(32c)
Internal Floor 1			78.6500			18.0000	1415.7000	(32d)
Internal Ceiling 1			78.6500			9.0000	707.8500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		30485.6700	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							177.3144	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	41.5200	0.0590	2.4497
E16 Corner (normal)	24.8000	0.0350	0.8680

E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0660	-0.3168	
E12 Gable (insulation at ceiling level)	19.5400	0.0410	0.8011	
E10 Eaves (insulation at ceiling level)	32.8600	0.0640	2.1030	
E6 Intermediate floor within a dwelling	25.4100	0.0010	0.0254	
E24 Eaves (insulation at ceiling level - inverted)	10.8500	0.1500	1.6275	
E2 Other lintels (including other steel lintels)	23.7200	0.0310	0.7353	
E3 Sill	21.8600	0.0290	0.6339	
E4 Jamb	55.4000	0.0240	1.3296	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.2568 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 91.1252 (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	76.5855	76.3562	76.1314	75.0756	74.8780	73.9584	73.9584	73.7881	74.3127	74.8780	75.2776	75.6954	(38)
Heat transfer coeff	167.7107	167.4814	167.2566	166.2008	166.0032	165.0837	165.0837	164.9134	165.4379	166.0032	166.4029	166.8206	(39)
Average = Sum(39)m / 12 =												166.1998	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9755	0.9741	0.9728	0.9667	0.9655	0.9602	0.9602	0.9592	0.9622	0.9655	0.9679	0.9703	(40)
HLP (average)												0.9667	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9652 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.9357	72.8246	71.2055	68.1076	65.8215	63.2720	61.8228	63.4297	65.1911	67.9285	71.0929	73.6524	(42a)
Hot water usage for baths	31.9180	31.4440	30.7764	29.5456	28.6240	27.6021	27.0501	27.7130	28.4347	29.5282	30.7843	31.8101	(42b)
Hot water usage for other uses	44.9961	43.3599	41.7237	40.0874	38.4512	36.8150	36.8150	38.4512	40.0874	41.7237	43.3599	44.9961	(42c)
Average daily hot water use (litres/day)												138.6648	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8498	147.6284	143.7055	137.7407	132.8967	127.6890	125.6879	129.5939	133.7132	139.1803	145.2371	150.4586	(44)
Energy conte	238.9091	210.2209	220.8701	188.5601	178.9045	157.0086	152.0087	160.4643	164.8818	188.8664	206.9169	235.5818	(45)
Energy content (annual)										Total = Sum(45)m =		2303.1929	
Distribution loss (46)m = 0.15 x (45)m	35.8364	31.5331	33.1305	28.2840	26.8357	23.5513	22.8013	24.0696	24.7323	28.3300	31.0375	35.3373	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.0800	(55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	272.3891	240.4609	254.3501	220.9601	212.3845	189.4086	185.4887	193.9443	197.2818	222.3464	239.3169	269.0618	(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	272.3891	240.4609	254.3501	220.9601	212.3845	189.4086	185.4887	193.9443	197.2818	222.3464	239.3169	269.0618	(64)
										Total per year (kWh/year) = Sum(64)m =		2697.3929	(64)
12Total per year (kWh/year)												2697	(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	106.2213	94.0904	100.2233	88.6162	86.2697	78.1254	77.3269	80.1384	80.7432	89.5821	94.7199	105.1149	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	181.2340	200.6519	181.2340	187.2751	181.2340	187.2751	181.2340	181.2340	187.2751	181.2340	187.2751	181.2340	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.5129	347.0775	338.0949	318.9719	294.8325	272.1449	256.9882	253.4236	262.4063	281.5293	305.6686	328.3562	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	(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)	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	(71)
Water heating gains (Table 5)	142.7706	140.0155	134.7087	123.0781	115.9539	108.5074	103.9340	107.7129	112.1433	120.4060	131.5554	141.2835	(72)
Total internal gains	734.9947	755.2222	721.5148	696.8023	659.4977	635.4047	609.6334	609.8477	629.3020	650.6465	691.9763	718.3510	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	25.2100	10.6334	0.7200	0.7000	0.7700	93.6286	(74)
East	0.5600	19.6403	0.7200	0.7000	0.7700	3.8415	(76)
West	1.3800	19.6403	0.7200	0.7000	0.7700	9.4665	(80)

Solar gains	106.9366	204.9623	346.9172	550.9007	734.5131	782.7278	732.2209	585.8240	415.4227	243.8823	132.0964	88.9973	(83)
Total gains	841.9313	960.1845	1068.4320	1247.7030	1394.0108	1418.1325	1341.8543	1195.6717	1044.7247	894.5288	824.0728	807.3482	(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	50.4931	50.5623	50.6302	50.9519	51.0125	51.2967	51.2967	51.3496	51.1868	51.0125	50.8900	50.7626	
alpha	4.3662	4.3708	4.3753	4.3968	4.4008	4.4198	4.4198	4.4233	4.4125	4.4008	4.3927	4.3842	
util living area													
	0.9963	0.9929	0.9843	0.9496	0.8539	0.6801	0.5242	0.6006	0.8494	0.9725	0.9931	0.9970	(86)
MIT	19.3433	19.5276	19.8394	20.3008	20.7008	20.9220	20.9806	20.9657	20.7847	20.2750	19.7355	19.3109	(87)
Th 2	20.1038	20.1050	20.1060	20.1112	20.1122	20.1166	20.1166	20.1175	20.1149	20.1122	20.1102	20.1082	(88)
util rest of house													
	0.9954	0.9912	0.9803	0.9360	0.8156	0.6065	0.4265	0.4994	0.7949	0.9627	0.9911	0.9962	(89)
MIT 2	18.1400	18.3763	18.7742	19.3560	19.8302	20.0616	20.1077	20.1001	19.9359	19.3324	18.6466	18.1016	(90)
Living area fraction										fLA = Living area / (4) =		0.1302	(91)
MIT	18.2966	18.5262	18.9128	19.4790	19.9435	20.1736	20.2213	20.2128	20.0464	19.4551	18.7883	18.2590	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2966	18.5262	18.9128	19.4790	19.9435	20.1736	20.2213	20.2128	20.0464	19.4551	18.7883	18.2590	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9927	0.9867	0.9727	0.9238	0.8072	0.6116	0.4385	0.5109	0.7899	0.9528	0.9866	0.9939	(94)
Useful gains	835.7678	947.4190	1039.2649	1152.5793	1125.2831	867.2935	588.4054	610.8573	825.2575	852.2888	813.0412	802.3971	(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													
	2347.3875	2282.1304	2076.1293	1758.2355	1368.4551	920.1105	597.8242	628.7750	983.7590	1469.9745	1944.9709	2345.3300	(97)
Space heating kWh													
	1124.6450	896.9261	771.4271	436.0724	180.9200	0.0000	0.0000	0.0000	0.0000	459.5582	814.9894	1147.9421	(98a)
Space heating requirement - total per year (kWh/year)												5832.4803	
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													
	1124.6450	896.9261	771.4271	436.0724	180.9200	0.0000	0.0000	0.0000	459.5582	814.9894	1147.9421	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												5832.4803	
Space heating per m2											(98c) / (4) =	33.9236	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1124.6450	896.9261	771.4271	436.0724	180.9200	0.0000	0.0000	0.0000	0.0000	459.5582	814.9894	1147.9421	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	1124.6450	896.9261	771.4271	436.0724	180.9200	0.0000	0.0000	0.0000	0.0000	459.5582	814.9894	1147.9421	(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													
	272.3891	240.4609	254.3501	220.9601	212.3845	189.4086	185.4887	193.9443	197.2818	222.3464	239.3169	269.0618	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	272.3891	240.4609	254.3501	220.9601	212.3845	189.4086	185.4887	193.9443	197.2818	222.3464	239.3169	269.0618	(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	45.9061	36.8276	33.1591	24.2938	18.7652	15.3314	17.1183	22.2510	28.9018	37.9207	42.8314	47.1819	(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												5832.4803	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												2697.3929	(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)												370.4883	(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	8900.3615	(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	5832.4803	0.1550	903.7713	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2697.3929	0.1412	380.7622	(264)
Space and water heating			1284.5335	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	370.4883	0.1443	53.4729	(268)
Total CO2, kg/year			1338.0064	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.7800	(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	5832.4803	1.5737	9178.5292	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2697.3929	1.5220	4105.3481	(278)
Space and water heating			13283.8774	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	370.4883	1.5338	568.2673	(282)
Total Primary energy kWh/year			13852.1447	(286)
Dwelling Primary energy Rate (DPER)			80.5700	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		93.2800 (1b)	x	2.4000 (2b)	=	223.8720	(1b) - (3b)
First floor		78.6500 (1c)	x	2.6000 (2c)	=	204.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.9300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	428.3620	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0934	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3434	(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) =	0.2919	(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	0.3721	0.3648	0.3575	0.3211	0.3138	0.2773	0.2773	0.2700	0.2919	0.3138	0.3284	0.3429	(22b)
Effective ac	0.5692	0.5666	0.5639	0.5515	0.5492	0.5384	0.5384	0.5364	0.5426	0.5492	0.5539	0.5588	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			3.9000	1.0000	3.9000			(26)
TER Opening Type (Uw = 1.20)			27.1500	1.1450	31.0878			(27)

Heatloss Floor 1			93.2800	0.1300	12.1264		(28a)
External Wall 1	194.9100	31.0500	163.8600	0.1800	29.4948		(29a)
main	78.6500		78.6500	0.1100	8.6515		(30)
over gf	14.6300		14.6300	0.1100	1.6093		(30)
Total net area of external elements Aum(A, m2)			381.4700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		86.8698		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 177.3144 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	41.5200	0.1600	6.6432
E16 Corner (normal)	24.8000	0.0900	2.2320
E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0900	-0.4320
E12 Gable (insulation at ceiling level)	19.5400	0.0600	1.1724
E10 Eaves (insulation at ceiling level)	32.8600	0.0600	1.9716
E6 Intermediate floor within a dwelling	25.4100	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	10.8500	0.2400	2.6040
E2 Other lintels (including other steel lintels)	23.7200	0.0500	1.1860
E3 Sill	21.8600	0.0500	1.0930
E4 Jamb	55.4000	0.0500	2.7700

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.2402 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 106.1100 (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	80.4679	80.0878	79.7152	77.9653	77.6379	76.1138	76.1138	75.8316	76.7009	77.6379	78.3003	78.9927	(38)
Heat transfer coeff	186.5779	186.1978	185.8252	184.0753	183.7479	182.2238	182.2238	181.9416	182.8109	183.7479	184.4102	185.1027	(39)
Average = Sum(39)m / 12 =												184.0738	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0852	1.0830	1.0808	1.0706	1.0687	1.0599	1.0599	1.0582	1.0633	1.0687	1.0726	1.0766	(40)
HLP (average)												1.0706	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9652 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.9357	72.8246	71.2055	68.1076	65.8215	63.2720	61.8228	63.4297	65.1911	67.9285	71.0929	73.6524	(42a)
Hot water usage for baths	31.9180	31.4440	30.7764	29.5456	28.6240	27.6021	27.0501	27.7130	28.4347	29.5282	30.7843	31.8101	(42b)
Hot water usage for other uses	44.9961	43.3599	41.7237	40.0874	38.4512	36.8150	36.8150	38.4512	40.0874	41.7237	43.3599	44.9961	(42c)
Average daily hot water use (litres/day)												138.6648	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8498	147.6284	143.7055	137.7407	132.8967	127.6890	125.6879	129.5939	133.7132	139.1803	145.2371	150.4586	(44)
Energy conte	238.9091	210.2209	220.8701	188.5601	178.9045	157.0086	152.0087	160.4643	164.8818	188.8664	206.9169	235.5818	(45)
Energy content (annual)										Total = Sum(45)m =		2303.1929	
Distribution loss (46)m = 0.15 x (45)m	35.8364	31.5331	33.1305	28.2840	26.8357	23.5513	22.8013	24.0696	24.7323	28.3300	31.0375	35.3373	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0208	(55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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	293.8159	259.8141	275.7769	241.6957	233.8113	210.1442	206.9154	215.3711	218.0174	243.7732	260.0525	290.4886	(62)
WWHRS	-33.8003	-29.8933	-31.3025	-25.9197	-24.1562	-20.6707	-19.3755	-20.6039	-21.3867	-25.2125	-28.5627	-33.1744	(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	260.0156	229.9208	244.4744	215.7760	209.6550	189.4735	187.5400	194.7672	196.6307	218.5606	231.4897	257.3142	(64)
									Total per year (kWh/year) = Sum(64)m =			2635.6178	(64)
12Total per year (kWh/year)												2636	(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	123.3627	109.5730	117.3647	105.2047	103.4112	94.7138	94.4683	97.2798	97.3317	106.7235	111.3083	122.2564	(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	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	181.2340	200.6519	181.2340	187.2751	181.2340	187.2751	181.2340	181.2340	187.2751	181.2340	187.2751	181.2340	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.5129	347.0775	338.0949	318.9719	294.8325	272.1449	256.9882	253.4236	262.4063	281.5293	305.6686	328.3562	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	(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)	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	(71)
Water heating gains (Table 5)	165.8101	163.0551	157.7483	146.1177	138.9935	131.5470	126.9735	130.7524	135.1829	143.4456	154.5949	164.3231	(72)
Total internal gains	761.0343	781.2618	747.5544	722.8419	685.5372	658.4443	632.6730	632.8873	652.3415	676.6861	718.0159	744.3905	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	25.2100	10.6334	0.6300	0.7000	0.7700	81.9250	(74)
East	0.5600	19.6403	0.6300	0.7000	0.7700	3.3613	(76)
West	1.3800	19.6403	0.6300	0.7000	0.7700	8.2832	(80)

Solar gains	93.5695	179.3420	303.5526	482.0381	642.6990	684.8869	640.6932	512.5960	363.4949	213.3970	115.5844	77.8726	(83)
Total gains	854.6038	960.6038	1051.1069	1204.8800	1328.2362	1343.3311	1273.3662	1145.4832	1015.8364	890.0831	833.6003	822.2631	(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	45.3872	45.4798	45.5710	46.0042	46.0862	46.4717	46.4717	46.5437	46.3224	46.0862	45.9207	45.7489	
alpha	4.0258	4.0320	4.0381	4.0669	4.0724	4.0981	4.0981	4.1029	4.0882	4.0724	4.0614	4.0499	
util living area	0.9960	0.9931	0.9863	0.9605	0.8894	0.7433	0.5910	0.6626	0.8797	0.9757	0.9929	0.9966	(86)
MIT	19.1381	19.3187	19.6356	20.1172	20.5645	20.8613	20.9592	20.9355	20.6960	20.1395	19.5687	19.1132	(87)
Th 2	20.0129	20.0148	20.0165	20.0249	20.0264	20.0337	20.0337	20.0351	20.0309	20.0264	20.0233	20.0200	(88)
util rest of house	0.9950	0.9913	0.9825	0.9489	0.8552	0.6667	0.4774	0.5501	0.8287	0.9666	0.9908	0.9958	(89)
MIT 2	17.8172	18.0492	18.4546	19.0673	19.6090	19.9334	20.0149	20.0019	19.7739	19.1031	18.3754	17.7899	(90)
Living area fraction										fLA = Living area / (4) =		0.1302	(91)
MIT	17.9891	18.2145	18.6083	19.2040	19.7334	20.0542	20.1378	20.1234	19.8939	19.2380	18.5308	17.9621	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9891	18.2145	18.6083	19.2040	19.7334	20.0542	20.1378	20.1234	19.8939	19.2380	18.5308	17.9621	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9919	0.9865	0.9748	0.9360	0.8428	0.6685	0.4904	0.5613	0.8199	0.9560	0.9859	0.9930	(94)
Useful gains	847.6460	947.6268	1024.6225	1127.7096	1119.4353	898.0361	624.4830	643.0069	832.8671	850.9237	821.8504	816.5310	(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	2554.0835	2479.1292	2250.0304	1896.7064	1476.1218	993.8801	644.6707	677.4478	1059.1879	1587.2120	2107.9488	2547.4042	(97)
Space heating kWh	1269.5895	1029.1696	911.7034	553.6777	265.3748	0.0000	0.0000	0.0000	0.0000	547.7985	925.9908	1287.7696	(98a)
Space heating requirement - total per year (kWh/year)												6791.0739	
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	1269.5895	1029.1696	911.7034	553.6777	265.3748	0.0000	0.0000	0.0000	0.0000	547.7985	925.9908	1287.7696	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6791.0739	
Space heating per m2											(98c) / (4) =	39.4991	(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	1269.5895	1029.1696	911.7034	553.6777	265.3748	0.0000	0.0000	0.0000	0.0000	547.7985	925.9908	1287.7696	(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)	1375.5032	1115.0267	987.7610	599.8675	287.5133	0.0000	0.0000	0.0000	0.0000	593.4978	1003.2403	1395.2000	(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	260.0156	229.9208	244.4744	215.7760	209.6550	189.4735	187.5400	194.7672	196.6307	218.5606	231.4897	257.3142	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.1296	87.0081	86.7316	86.0776	84.5894	79.8000	79.8000	79.8000	79.8000	86.0328	86.8412	87.1629	(217)
Fuel for water heating, kWh/month	298.4241	264.2523	281.8745	250.6761	247.8501	237.4355	235.0125	244.0692	246.4044	254.0434	266.5666	295.2108	(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	37.6568	30.2097	27.2005	19.9283	15.3932	12.5763	14.0422	18.2525	23.7082	31.1065	35.1347	38.7034	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-77.8912	-105.3372	-145.2446	-156.3343	-162.7787	-149.7227	-147.6626	-142.0500	-131.5632	-116.8531	-83.9355	-67.8602	(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	-58.6891	-121.4307	-237.7995	-352.2310	-461.2033	-461.9452	-456.6881	-388.8793	-287.8782	-172.1914	-77.8453	-46.5832	(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	7357.6099	(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	3121.8195	(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)	303.9123	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4610.5977	(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	6258.7439	(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	7357.6099	0.2100	1545.0981	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3121.8195	0.2100	655.5821	(264)
Space and water heating			2200.6802	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	303.9123	0.1443	43.8639	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1487.2333	0.1355	-201.5603	
PV Unit electricity exported	-3123.3644	0.1263	-394.4854	
Total			-596.0457	(269)
Total CO2, kg/year			1660.4276	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6600	(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	7357.6099	1.1300	8314.0992	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3121.8195	1.1300	3527.6560	(278)
Space and water heating			11841.7552	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	303.9123	1.5338	466.1508	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1487.2333	1.5009	-2232.2435	
PV Unit electricity exported	-3123.3644	0.4636	-1448.0872	
Total			-3680.3307	(283)
Total Primary energy kWh/year			8757.6760	(286)
Target Primary Energy Rate (TPER)			50.9400	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 9	Assessment Date	27/09/2024
Property Address	Pre renewable	Date of Test	
Address	Plot 9 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

DER Rating	63 D	TER	7.93	TFEE	9.99
Environmental	92 A	% DER < TER			20.62
CO2 Emissions (Target)	0.86	DFEE	36.11	TFEE	40.61
Compliance Check	See BREL	% DFEE < TFEE			11.09
% Heat & Power	-57.85	DPER	82.33	TPER	52.16

Assessor Details	Mr. Neil Rothon	Assessor ID	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.8100 (1b)	x	2.4000 (2b)	=	155.5440	(1b) - (3b)
First floor	64.8100 (1c)	x	2.6000 (2c)	=	168.5060	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	129.6200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	324.0500	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1234	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2734	(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) =	0.2529	(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	0.3225	0.3162	0.3098	0.2782	0.2719	0.2403	0.2403	0.2340	0.2529	0.2719	0.2845	0.2972	(22b)
Effective ac	0.5520	0.5500	0.5480	0.5387	0.5370	0.5289	0.5289	0.5274	0.5320	0.5370	0.5405	0.5442	(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	
Front door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			24.6600	1.1450	28.2366			(27)
rl			0.7200	1.2357	0.8897			(27a)
rl			0.7200	1.2357	0.8897			(27a)
Heatloss Floor 1			64.8100	0.1000	6.4810	75.0000	4860.7500	(28a)
External Wall 1	146.8200	22.4100	124.4100	0.1500	18.6615	110.0000	13685.1000	(29a)
dormers	6.8000	4.2000	2.6000	0.1800	0.4680	9.0000	23.4000	(29a)
External Roof 1	56.1500		56.1500	0.1200	6.7380	9.0000	505.3500	(30)
sloping	19.8100	1.4400	18.3700	0.1600	2.9392	9.0000	165.3300	(30)
Total net area of external elements Aum(A, m2)			294.3900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		67.6438			(33)
Internal Wall 1			215.8000			9.0000	1942.2000	(32c)
Internal Floor 1			64.8100			18.0000	1166.5800	(32d)
Internal Ceiling 1			64.8100			9.0000	583.2900	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		22932.0000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							176.9171	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	34.2600	0.0590	2.0213	
E16 Corner (normal)	17.0000	0.0350	0.5950	
E17 Corner (inverted - internal area greater than external area)	3.4200	-0.0660	-0.2257	
E13 Gable (insulation at rafter level)	7.2000	0.0420	0.3024	
E11 Eaves (insulation at rafter level)	13.7600	0.0220	0.3027	
E12 Gable (insulation at ceiling level)	12.4000	0.0410	0.5084	
E6 Intermediate floor within a dwelling	34.2600	0.0010	0.0343	
E16 Corner (normal)	7.5600	0.1800	1.3608	
R4 Ridge (vaulted ceiling)	2.7000	0.1200	0.3240	
R9 Roof to wall (flat ceiling)	9.0000	0.3200	2.8800	
R7 Flat ceiling (inverted)	5.4000	0.1200	0.6480	
E3 Sill	18.5900	0.0000	0.0000	
R11 Upstands or kerbs of rooflights	6.8000	0.2400	1.6320	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.3832 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 78.0270 (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	59.0288	58.8129	58.6012	57.6071	57.4211	56.5553	56.5553	56.3950	56.8888	57.4211	57.7974	58.1908	(38)
Heat transfer coeff	137.0558	136.8399	136.6282	135.6341	135.4481	134.5823	134.5823	134.4220	134.9158	135.4481	135.8244	136.2178	(39)
Average = Sum(39)m / 12 =												135.6332	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0574	1.0557	1.0541	1.0464	1.0450	1.0383	1.0383	1.0370	1.0409	1.0450	1.0479	1.0509	(40)
HLP (average)												1.0464	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8940 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.7427	71.6495	70.0565	67.0086	64.7594	62.2510	60.8253	62.4062	64.1392	66.8324	69.9457	72.4640	(42a)
Hot water usage for baths	31.4049	30.9385	30.2817	29.0707	28.1639	27.1584	26.6153	27.2675	27.9776	29.0536	30.2895	31.2988	(42b)
Hot water usage for other uses	44.2674	42.6577	41.0480	39.4383	37.8285	36.2188	36.2188	37.8285	39.4383	41.0480	42.6577	44.2674	(42c)
Average daily hot water use (litres/day)												136.4268	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.4151	145.2457	141.3862	135.5176	130.7518	125.6283	123.6594	127.5023	131.5551	136.9339	142.8930	148.0302	(44)
Energy conte	235.0532	206.8280	217.3054	185.5168	176.0171	154.4746	149.5553	157.8744	162.2206	185.8181	203.5772	231.7795	(45)
Energy content (annual)										Total = Sum(45)m =		2266.0203	
Distribution loss (46)m = 0.15 x (45)m	35.2580	31.0242	32.5958	27.8275	26.4026	23.1712	22.4333	23.6812	24.3331	27.8727	30.5366	34.7669	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.0800	(55)
Total storage loss	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(56)
If cylinder contains dedicated solar storage	33.4800	30.2400	33.4800	32.4000	33.4800	32.4000	33.4800	33.4800	32.4000	33.4800	32.4000	33.4800	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	268.5332	237.0680	250.7854	217.9168	209.4971	186.8746	183.0353	191.3544	194.6206	219.2981	235.9772	265.2595	(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	268.5332	237.0680	250.7854	217.9168	209.4971	186.8746	183.0353	191.3544	194.6206	219.2981	235.9772	265.2595	(64)
										Total per year (kWh/year) = Sum(64)m =		2660.2203	(64)
12Total per year (kWh/year)												2660	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	104.9392	92.9623	99.0380	87.6044	85.3097	77.2828	76.5111	79.2772	79.8583	88.5685	93.6094	103.8507	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	150.7234	166.8723	150.7234	155.7475	150.7234	155.7475	150.7234	150.7234	155.7475	150.7234	155.7475	150.7234	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.2620	300.3466	292.5734	276.0251	255.1359	235.5030	222.3871	219.3024	227.0756	243.6239	264.5131	284.1460	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	(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)	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	(71)
Water heating gains (Table 5)	141.0473	138.3368	133.1156	121.6727	114.6636	107.3372	102.8376	106.5554	110.9144	119.0437	130.0131	139.5842	(72)
Total internal gains	655.4426	671.9657	642.8224	619.8553	586.9328	564.9977	542.3580	542.9912	560.1475	579.8009	616.6836	640.8636	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	1.4400	26.0000	0.4000	0.7000	1.0000	9.4349	(82)
North	1.5700	10.6334	0.7200	0.7000	0.7700	5.8309	(74)

East			8.8100		19.6403		0.7200	0.7000		0.7700		60.4348	(76)
West			14.2800		19.6403		0.7200	0.7000		0.7700		97.9579	(80)
Solar gains	173.6584	340.5883	564.0496	829.0567	1022.7015	1050.0899	998.4098	852.9917	657.9718	404.8772	216.6652	142.7358	(83)
Total gains	829.1010	1012.5540	1206.8720	1448.9120	1609.6344	1615.0876	1540.7678	1395.9829	1218.1192	984.6781	833.3489	783.5994	(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	46.4774	46.5508	46.6229	46.9646	47.0291	47.3316	47.3316	47.3881	47.2146	47.0291	46.8988	46.7634	
alpha	4.0985	4.1034	4.1082	4.1310	4.1353	4.1554	4.1554	4.1592	4.1476	4.1353	4.1266	4.1176	
util living area	0.9900	0.9773	0.9446	0.8518	0.6964	0.5143	0.3798	0.4345	0.6854	0.9186	0.9806	0.9920	(86)
MIT	19.3856	19.6649	20.0743	20.5512	20.8469	20.9661	20.9924	20.9869	20.8940	20.4439	19.8197	19.3356	(87)
Th 2	20.0358	20.0372	20.0385	20.0448	20.0460	20.0516	20.0516	20.0526	20.0494	20.0460	20.0436	20.0411	(88)
util rest of house	0.9877	0.9722	0.9322	0.8218	0.6444	0.4448	0.3000	0.3487	0.6138	0.8945	0.9753	0.9901	(89)
MIT 2	18.1480	18.5027	19.0151	19.5907	19.9141	20.0298	20.0484	20.0467	19.9716	19.4818	18.7066	18.0879	(90)
Living area fraction										fLA = Living area / (4) =		0.2119	(91)
MIT	18.4103	18.7490	19.2395	19.7943	20.1118	20.2282	20.2484	20.2460	20.1671	19.6857	18.9425	18.3523	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4103	18.7490	19.2395	19.7943	20.1118	20.2282	20.2484	20.2460	20.1671	19.6857	18.9425	18.3523	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9820	0.9629	0.9195	0.8129	0.6482	0.4581	0.3168	0.3666	0.6233	0.8834	0.9669	0.9853	(94)
Useful gains	814.1816	975.0026	1109.6908	1177.8582	1043.3255	739.8052	488.1198	511.7230	759.2568	869.8794	805.7788	772.0633	(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	1933.8950	1895.0935	1740.5820	1477.6379	1139.3581	757.4595	491.0164	516.9817	818.5424	1230.6386	1608.5038	1927.7981	(97)
Space heating kWh	833.0667	618.3011	469.3830	215.8413	71.4482	0.0000	0.0000	0.0000	0.0000	268.4048	577.9620	859.8667	(98a)
Space heating requirement - total per year (kWh/year)												3914.2740	
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	833.0667	618.3011	469.3830	215.8413	71.4482	0.0000	0.0000	0.0000	0.0000	268.4048	577.9620	859.8667	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3914.2740	
Space heating per m2											(98c) / (4) =	30.1981	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement	833.0667	618.3011	469.3830	215.8413	71.4482	0.0000	0.0000	0.0000	0.0000	268.4048	577.9620	859.8667	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	833.0667	618.3011	469.3830	215.8413	71.4482	0.0000	0.0000	0.0000	0.0000	268.4048	577.9620	859.8667	(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	268.5332	237.0680	250.7854	217.9168	209.4971	186.8746	183.0353	191.3544	194.6206	219.2981	235.9772	265.2595	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month	268.5332	237.0680	250.7854	217.9168	209.4971	186.8746	183.0353	191.3544	194.6206	219.2981	235.9772	265.2595	(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	36.1792	29.0243	26.1331	19.1463	14.7891	12.0828	13.4911	17.5363	22.7779	29.8858	33.7560	37.1847	(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												3914.2740	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												2660.2203	(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)	291.9865	(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	6866.4808	(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	3914.2740	0.1560	610.7637	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2660.2203	0.1412	375.4994	(264)
Space and water heating			986.2631	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	291.9865	0.1443	42.1427	(268)
Total CO2, kg/year			1028.4058	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.9300	(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	3914.2740	1.5777	6175.3718	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2660.2203	1.5219	4048.7142	(278)
Space and water heating			10224.0860	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	291.9865	1.5338	447.8587	(282)
Total Primary energy kWh/year			10671.9447	(286)
Dwelling Primary energy Rate (DPER)			82.3300	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.8100 (1b)	x	2.4000 (2b)	=	155.5440	(1b) - (3b)
First floor	64.8100 (1c)	x	2.6000 (2c)	=	168.5060	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	129.6200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	324.0500	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1234	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3734	(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) =	0.3454	(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	0.4404	0.4318	0.4232	0.3800	0.3713	0.3282	0.3282	0.3195	0.3454	0.3713	0.3886	0.4059	(22b)
Effective ac	0.5970	0.5932	0.5895	0.5722	0.5689	0.5538	0.5538	0.5510	0.5597	0.5689	0.5755	0.5824	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.9500	1.0000	1.9500			(26)
TER Opening Type (Uw = 1.20)			24.6600	1.1450	28.2366			(27)
rl			0.7200	2.0221	1.4559			(27a)
rl			0.7200	2.0221	1.4559			(27a)
Heatloss Floor 1			64.8100	0.1300	8.4253			(28a)
External Wall 1	146.8200	22.4100	124.4100	0.1800	22.3938			(29a)
dormers	6.8000	4.2000	2.6000	0.1800	0.4680			(29a)
External Roof 1	56.1500		56.1500	0.1100	6.1765			(30)
sloping	19.8100	1.4400	18.3700	0.1100	2.0207			(30)
Total net area of external elements Aum(A, m2)			294.3900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	72.5827			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 176.9171 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.2600	0.1600	5.4816
E16 Corner (normal)	17.0000	0.0900	1.5300
E17 Corner (inverted - internal area greater than external area)	3.4200	-0.0900	-0.3078
E13 Gable (insulation at rafter level)	7.2000	0.0800	0.5760
E11 Eaves (insulation at rafter level)	13.7600	0.0400	0.5504
E12 Gable (insulation at ceiling level)	12.4000	0.0600	0.7440
E6 Intermediate floor within a dwelling	34.2600	0.0000	0.0000
E16 Corner (normal)	7.5600	0.0900	0.6804
R4 Ridge (vaulted ceiling)	2.7000	0.0800	0.2160
R9 Roof to wall (flat ceiling)	9.0000	0.0400	0.3600
R7 Flat ceiling (inverted)	5.4000	0.0400	0.2160
E3 Sill	18.5900	0.0500	0.9295
R11 Upstands or kerbs of rooflights	6.8000	0.0800	0.5440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.5201 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 84.1028 (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	63.8396	63.4369	63.0421	61.1880	60.8411	59.2261	59.2261	58.9271	59.8482	60.8411	61.5428	62.2765	(38)
Heat transfer coeff	147.9424	147.5397	147.1449	145.2908	144.9439	143.3289	143.3289	143.0299	143.9510	144.9439	145.6457	146.3793	(39)

Average = Sum(39)m / 12 = 145.2891

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1414	1.1382	1.1352	1.1209	1.1182	1.1058	1.1058	1.1035	1.1106	1.1182	1.1236	1.1293	(40)
HLP (average)												1.1209	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8940 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.7427	71.6495	70.0565	67.0086	64.7594	62.2510	60.8253	62.4062	64.1392	66.8324	69.9457	72.4640	(42a)
Hot water usage for baths	31.4049	30.9385	30.2817	29.0707	28.1639	27.1584	26.6153	27.2675	27.9776	29.0536	30.2895	31.2988	(42b)
Hot water usage for other uses	44.2674	42.6577	41.0480	39.4383	37.8285	36.2188	36.2188	37.8285	39.4383	41.0480	42.6577	44.2674	(42c)

Average daily hot water use (litres/day) 136.4268 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.4151	145.2457	141.3862	135.5176	130.7518	125.6283	123.6594	127.5023	131.5551	136.9339	142.8930	148.0302	(44)
Energy conte	235.0532	206.8280	217.3054	185.5168	176.0171	154.4746	149.5553	157.8744	162.2206	185.8181	203.5772	231.7795	(45)
Energy content (annual)										Total = Sum(45)m =		2266.0203	
Distribution loss (46)m = 0.15 x (45)m	35.2580	31.0242	32.5958	27.8275	26.4026	23.1712	22.4333	23.6812	24.3331	27.8727	30.5366	34.7669	(46)

Water storage loss:
Store volume 250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8903 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 1.0208 (55)
Total storage loss

	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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	289.9600	256.4212	272.2122	238.6525	230.9239	207.6102	204.4621	212.7812	215.3562	240.7249	256.7128	286.6863	(62)
WWHRS	-33.2549	-29.4109	-30.7974	-25.5015	-23.7665	-20.3371	-19.0628	-20.2714	-21.0416	-24.8057	-28.1018	-32.6391	(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	256.7051	227.0103	241.4148	213.1510	207.1574	187.2731	185.3993	192.5098	194.3146	215.9192	228.6110	254.0472	(64)
										Total per year (kWh/year) = Sum(64)m =		2603.5127	(64)
12Total per year (kWh/year)												2604	(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	122.0806	108.4449	116.1795	104.1928	102.4511	93.8713	93.6526	96.4187	96.4468	105.7099	110.1979	120.9921	(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	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	150.7234	166.8723	150.7234	155.7475	150.7234	155.7475	150.7234	150.7234	155.7475	150.7234	155.7475	150.7234	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.2620	300.3466	292.5734	276.0251	255.1359	235.5030	222.3871	219.3024	227.0756	243.6239	264.5131	284.1460	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	(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)													
	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	(71)
Water heating gains (Table 5)													
	164.0868	161.3763	156.1552	144.7123	137.7031	130.3768	125.8771	129.5950	133.9539	142.0833	153.0527	162.6238	(72)
Total internal gains													
	681.4822	698.0052	668.8620	645.8949	612.9724	588.0373	565.3975	566.0307	583.1870	605.8405	642.7232	666.9031	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.5700	10.6334	0.6300	0.7000	0.7700	5.1020	(74)
East	8.8100	19.6403	0.6300	0.7000	0.7700	52.8804	(76)
West	14.2800	19.6403	0.6300	0.7000	0.7700	85.7131	(80)
East	1.4400	26.0000	0.6300	0.7000	1.0000	14.8599	(82)

Solar gains	158.5555	311.7316	517.9289	763.5270	943.6349	969.6319	921.6176	786.2482	604.9371	371.0326	197.9646	130.2282	(83)
Total gains	840.0377	1009.7368	1186.7909	1409.4218	1556.6073	1557.6691	1487.0151	1352.2790	1188.1241	976.8731	840.6878	797.1313	(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	43.0573	43.1748	43.2907	43.8431	43.9480	44.4432	44.4432	44.5361	44.2512	43.9480	43.7363	43.5171	
alpha	3.8705	3.8783	3.8860	3.9229	3.9299	3.9629	3.9629	3.9691	3.9501	3.9299	3.9158	3.9011	
util living area													
	0.9898	0.9788	0.9518	0.8743	0.7362	0.5569	0.4158	0.4718	0.7211	0.9275	0.9810	0.9916	(86)
MIT	19.2333	19.5040	19.9164	20.4306	20.7811	20.9458	20.9866	20.9783	20.8518	20.3482	19.7015	19.1963	(87)
Th 2	19.9672	19.9697	19.9722	19.9838	19.9860	19.9961	19.9961	19.9980	19.9922	19.9860	19.9816	19.9770	(88)
util rest of house													
	0.9874	0.9739	0.9405	0.8463	0.6834	0.4804	0.3247	0.3754	0.6474	0.9047	0.9757	0.9896	(89)
MIT 2	17.9087	18.2535	18.7725	19.4034	19.7952	19.9612	19.9906	19.9883	19.8822	19.3231	18.5152	17.8680	(90)
Living area fraction										fLA = Living area / (4) =		0.2119	(91)
MIT	18.1894	18.5185	19.0149	19.6211	20.0041	20.1698	20.2017	20.1981	20.0876	19.5403	18.7666	18.1495	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1894	18.5185	19.0149	19.6211	20.0041	20.1698	20.2017	20.1981	20.0876	19.5403	18.7666	18.1495	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9643	0.9270	0.8347	0.6844	0.4942	0.3437	0.3952	0.6550	0.8921	0.9668	0.9843	(94)
Useful gains	824.2606	973.6448	1100.1381	1176.3829	1065.3706	769.7591	511.1125	534.4447	778.2391	871.4932	812.8049	784.6207	(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													
	2054.8384	2009.2737	1841.5050	1557.6754	1203.6289	798.3191	516.2306	543.2464	861.9276	1295.8447	1699.1847	2041.9204	(97)
Space heating kWh													
	915.5499	695.9426	551.5769	274.5306	102.8641	0.0000	0.0000	0.0000	0.0000	315.7175	638.1934	935.4310	(98a)
Space heating requirement - total per year (kWh/year)												4429.8061	
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													
	915.5499	695.9426	551.5769	274.5306	102.8641	0.0000	0.0000	0.0000	0.0000	315.7175	638.1934	935.4310	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4429.8061	
Space heating per m2											(98c) / (4) =	34.1753	(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													
	915.5499	695.9426	551.5769	274.5306	102.8641	0.0000	0.0000	0.0000	0.0000	315.7175	638.1934	935.4310	(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)													
	991.9284	754.0007	597.5915	297.4329	111.4454	0.0000	0.0000	0.0000	0.0000	342.0558	691.4338	1013.4681	(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													
	256.7051	227.0103	241.4148	213.1510	207.1574	187.2731	185.3993	192.5098	194.3146	215.9192	228.6110	254.0472	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.6597	86.4032	85.8523	84.6284	82.5769	79.8000	79.8000	79.8000	79.8000	84.9106	86.2349	86.7113	(217)
Fuel for water heating, kWh/month													
	296.2219	262.7338	281.1979	251.8671	250.8661	234.6781	232.3300	241.2404	243.5020	254.2899	265.1025	292.9805	(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	31.3173	25.1239	22.6213	16.5733	12.8017	10.4591	11.6782	15.1797	19.7170	25.8697	29.2198	32.1877	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-57.5203	-79.5506	-112.1751	-123.6082	-131.1357	-121.5427	-119.9211	-114.1745	-103.8402	-89.6424	-62.6369	-49.9023	(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	(235a)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)

Electricity generated by PVs (Appendix M) (negative quantity)

(233b)m	-37.3743	-78.0054	-153.9601	-229.7378	-302.4007	-303.4380	-299.9756	-254.7098	-187.5834	-111.1829	-49.7667	-29.6118 (233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)

(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)

Electricity generated by hydro-electric generators (Appendix M) (negative quantity)

(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4799.3566	(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	3107.0099	(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)	252.7489	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3203.3966	(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	5041.7187	(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	4799.3566	0.2100	1007.8649	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3107.0099	0.2100	652.4721	(264)
Space and water heating			1660.3370	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	252.7489	0.1443	36.4795	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1165.6501	0.1350	-157.3886	
PV Unit electricity exported	-2037.7465	0.1261	-256.9207	
Total			-414.3093	(269)
Total CO2, kg/year			1294.4364	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4799.3566	1.1300	5423.2730	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3107.0099	1.1300	3510.9212	(278)
Space and water heating			8934.1941	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	252.7489	1.5338	387.6746	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1165.6501	1.4990	-1747.3602	
PV Unit electricity exported	-2037.7465	0.4628	-943.0914	
Total			-2690.4516	(283)
Total Primary energy kWh/year			6761.5180	(286)
Target Primary Energy Rate (TPER)			52.1600	(287)

Appendix 3

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 1	Assessment Date	27/09/2024
Property Reference (cont.)	00001	Prop. Type Ref.	
Address	Plot 1 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

EI Rating	81 B	DER	4.12	TER	9.94
Environment	96 A	% DER < TER			58.55
CO2 Emissions (tonnes)	0.46	DFEE	35.89	TFEE	40.41
Compliance Check	See BREL	% DFEE < TFEE			11.19
Assessor's Name	17.07	DPER	43.05	TPER	51.91

Assessor Name	Mr. Neil Rothon	Accreditation	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.8100	(1b)	x 2.4000	(2b) =	155.5440	(1b) - (3b)
First floor	64.8100	(1c)	x 2.6000	(2c) =	168.5060	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	129.6200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		324.0500	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1234	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2734	(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) =	0.2529	(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	0.3225	0.3162	0.3098	0.2782	0.2719	0.2403	0.2403	0.2340	0.2529	0.2719	0.2845	0.2972	(22b)
Effective ac	0.5520	0.5500	0.5480	0.5387	0.5370	0.5289	0.5289	0.5274	0.5320	0.5370	0.5405	0.5442	(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	
Front door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			24.6600	1.1450	28.2366			(27)
rl			0.7200	1.2357	0.8897			(27a)
rl			0.7200	1.2357	0.8897			(27a)
Heatloss Floor 1			64.8100	0.1000	6.4810	75.0000	4860.7500	(28a)
External Wall 1	146.8200	22.4100	124.4100	0.1500	18.6615	110.0000	13685.1000	(29a)
dormers	6.8000	4.2000	2.6000	0.1800	0.4680	9.0000	23.4000	(29a)
External Roof 1	56.1500		56.1500	0.1200	6.7380	9.0000	505.3500	(30)
sloping	19.8100	1.4400	18.3700	0.1600	2.9392	9.0000	165.3300	(30)
Total net area of external elements Aum(A, m2)			294.3900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		67.6438			(33)
Internal Wall 1			215.8000			9.0000	1942.2000	(32c)
Internal Floor 1			64.8100			18.0000	1166.5800	(32d)
Internal Ceiling 1			64.8100			9.0000	583.2900	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		22932.0000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							176.9171	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	34.2600	0.0590	2.0213		
E16 Corner (normal)	17.0000	0.0350	0.5950		
E17 Corner (inverted - internal area greater than external area)	3.4200	-0.0660	-0.2257		
E13 Gable (insulation at rafter level)	7.2000	0.0420	0.3024		
E11 Eaves (insulation at rafter level)	13.7600	0.0220	0.3027		
E12 Gable (insulation at ceiling level)	12.4000	0.0410	0.5084		
E6 Intermediate floor within a dwelling	34.2600	0.0010	0.0343		
E16 Corner (normal)	7.5600	0.1800	1.3608		
R4 Ridge (vaulted ceiling)	2.7000	0.1200	0.3240		
R9 Roof to wall (flat ceiling)	9.0000	0.3200	2.8800		
R7 Flat ceiling (inverted)	5.4000	0.1200	0.6480		
E3 Sill	18.5900	0.0000	0.0000		
R11 Upstands or kerbs of rooflights	6.8000	0.2400	1.6320		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				10.3832	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	78.0270	(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	59.0288	58.8129	58.6012	57.6071	57.4211	56.5553	56.5553	56.3950	56.8888	57.4211	57.7974	58.1908	(38)
Heat transfer coeff	137.0558	136.8399	136.6282	135.6341	135.4481	134.5823	134.5823	134.4220	134.9158	135.4481	135.8244	136.2178	(39)
Average = Sum(39)m / 12 =												135.6332	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0574	1.0557	1.0541	1.0464	1.0450	1.0383	1.0383	1.0370	1.0409	1.0450	1.0479	1.0509	(40)
HLP (average)												1.0464	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8940 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
72.7427	71.6495	70.0565	67.0086	64.7594	62.2510	60.8253	62.4062	64.1392	66.8324	69.9457	72.4640	(42a)

Hot water usage for baths

31.4049	30.9385	30.2817	29.0707	28.1639	27.1584	26.6153	27.2675	27.9776	29.0536	30.2895	31.2988	(42b)

Hot water usage for other uses

44.2674	42.6577	41.0480	39.4383	37.8285	36.2188	36.2188	37.8285	39.4383	41.0480	42.6577	44.2674	(42c)

Average daily hot water use (litres/day) 136.4268 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.4151	145.2457	141.3862	135.5176	130.7518	125.6283	123.6594	127.5023	131.5551	136.9339	142.8930	148.0302	(44)
Energy conte	235.0532	206.8280	217.3054	185.5168	176.0171	154.4746	149.5553	157.8744	162.2206	185.8181	203.5772	231.7795	(45)
Energy content (annual)										Total = Sum(45)m =		2266.0203	
Distribution loss (46)m = 0.15 x (45)m	35.2580	31.0242	32.5958	27.8275	26.4026	23.1712	22.4333	23.6812	24.3331	27.8727	30.5366	34.7669	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9720	(55)
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(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	288.4476	255.0552	270.6998	237.1888	229.4115	206.1466	202.9497	211.2688	213.8926	239.2125	255.2492	285.1739	(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	288.4476	255.0552	270.6998	237.1888	229.4115	206.1466	202.9497	211.2688	213.8926	239.2125	255.2492	285.1739	(64)
										Total per year (kWh/year) = Sum(64)m =		2894.6963	(64)
12Total per year (kWh/year)												2895	(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	120.8707	107.3521	114.9696	103.0220	101.2412	92.7004	92.4427	95.2088	95.2759	104.5000	109.0270	119.7822	(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	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	150.7234	166.8723	150.7234	155.7475	150.7234	155.7475	150.7234	150.7234	155.7475	150.7234	155.7475	150.7234	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.2620	300.3466	292.5734	276.0251	255.1359	235.5030	222.3871	219.3024	227.0756	243.6239	264.5131	284.1460	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	(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)	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	(71)
Water heating gains (Table 5)	162.4606	159.7501	154.5290	143.0860	136.0769	128.7506	124.2509	127.9688	132.3277	140.4570	151.4264	160.9976	(72)
Total internal gains	676.8559	693.3790	664.2357	641.2686	608.3462	586.4111	563.7713	564.4045	581.5608	601.2143	638.0970	662.2769	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	1.4400	26.0000	0.4000	0.7000	1.0000	9.4349	(82)
North	1.0100	10.6334	0.7200	0.7000	0.7700	3.7511	(74)

East			8.8100		19.6403		0.7200		0.7000		0.7700	60.4348	(76)
South			0.5600		46.7521		0.7200		0.7000		0.7700	9.1443	(78)
West			14.2800		19.6403		0.7200		0.7000		0.7700	97.9579	(80)
Solar gains	180.7230	351.5897	576.3726	839.7692	1030.5556	1056.0677	1004.9299	861.9201	669.7795	416.2991	224.9387	148.9035	(83)
Total gains	857.5789	1044.9687	1240.6083	1481.0379	1638.9018	1642.4787	1568.7012	1426.3246	1251.3403	1017.5133	863.0356	811.1804	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	46.4774	46.5508	46.6229	46.9646	47.0291	47.3316	47.3316	47.3881	47.2146	47.0291	46.8988	46.7634	
alpha	4.0985	4.1034	4.1082	4.1310	4.1353	4.1554	4.1554	4.1592	4.1476	4.1353	4.1266	4.1176	
util living area	0.9887	0.9748	0.9399	0.8441	0.6878	0.5067	0.3734	0.4258	0.6725	0.9109	0.9781	0.9909	(86)
Living	19.4154	19.6969	20.1029	20.5688	20.8539	20.9679	20.9928	20.9879	20.9013	20.4686	19.8495	19.3648	
Non living	18.1858	18.5427	19.0498	19.6102	19.9205	20.0310	20.0486	20.0471	19.9775	19.5100	18.7439	18.1250	
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	20.1894	19.6969	20.1029	20.5688	20.8539	20.9679	20.9928	20.9879	20.9013	20.4686	19.8495	19.5935	(87)
Th 2	20.0358	20.0372	20.0385	20.0448	20.0460	20.0516	20.0516	20.0526	20.0494	20.0460	20.0436	20.0411	(88)
util rest of house	0.9861	0.9692	0.9267	0.8132	0.6357	0.4379	0.2948	0.3415	0.6009	0.8852	0.9723	0.9888	(89)
MIT 2	19.2983	18.5427	19.0498	19.6102	19.9205	20.0310	20.0486	20.0471	19.9775	19.5100	18.7439	18.4703	(90)
Living area fraction										fLA = Living area / (4) =		0.2119	(91)
MIT	19.4871	18.7873	19.2729	19.8134	20.1183	20.2296	20.2487	20.2465	20.1732	19.7131	18.9782	18.7083	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4871	18.7873	19.2729	19.8134	20.1183	20.2296	20.2487	20.2465	20.1732	19.7131	18.9782	18.7083	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9843	0.9594	0.9137	0.8049	0.6398	0.4511	0.3113	0.3591	0.6108	0.8744	0.9633	0.9848	(94)
Useful gains	844.1180	1002.5370	1133.6020	1192.0645	1048.6333	740.9456	488.3409	512.1862	764.3016	889.7190	831.3914	798.8262	(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	2081.4835	1900.3383	1745.1444	1480.2267	1140.2494	757.6397	491.0517	517.0552	819.3765	1234.3548	1613.3461	1976.2936	(97)
Space heating kWh	920.6000	603.3224	454.9876	207.4768	68.1624	0.0000	0.0000	0.0000	0.0000	256.4091	563.0074	876.0357	(98a)
Space heating requirement - total per year (kWh/year)												3950.0013	
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	920.6000	603.3224	454.9876	207.4768	68.1624	0.0000	0.0000	0.0000	0.0000	256.4091	563.0074	876.0357	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3950.0013	
Space heating per m2											(98c) / (4) =	30.4737	(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 %)												242.0371	(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	920.6000	603.3224	454.9876	207.4768	68.1624	0.0000	0.0000	0.0000	0.0000	256.4091	563.0074	876.0357	(98)
Space heating efficiency (main heating system 1)	242.0371	242.0371	242.0371	242.0371	242.0371	0.0000	0.0000	0.0000	0.0000	242.0371	242.0371	242.0371	(210)
Space heating fuel (main heating system)	380.3548	249.2685	187.9825	85.7210	28.1620	0.0000	0.0000	0.0000	0.0000	105.9379	232.6120	361.9427	(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	288.4476	255.0552	270.6998	237.1888	229.4115	206.1466	202.9497	211.2688	213.8926	239.2125	255.2492	285.1739	(64)
Efficiency of water heater												172.3171	(216)
(217)m	172.3171	172.3171	172.3171	172.3171	172.3171	172.3171	172.3171	172.3171	172.3171	172.3171	172.3171	172.3171	(217)
Fuel for water heating, kWh/month	167.3935	148.0150	157.0940	137.6467	133.1333	119.6321	117.7769	122.6047	124.1273	138.8211	148.1276	165.4936	(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	36.1792	29.0243	26.1331	19.1463	14.7891	12.0828	13.4911	17.5363	22.7779	29.8858	33.7560	37.1847	(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	1631.9814	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	172.3171	
Water heating fuel used	1679.8657	(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)	291.9865	(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	3603.8337	(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	1631.9814	0.1563	255.1462	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1679.8657	0.1410	236.7867	(264)
Space and water heating			491.9330	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	291.9865	0.1443	42.1427	(268)
Total CO2, kg/year			534.0756	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1200	(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	1631.9814	1.5788	2576.4959	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1679.8657	1.5212	2555.4219	(278)
Space and water heating			5131.9179	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	291.9865	1.5338	447.8587	(282)
Total Primary energy kWh/year			5579.7766	(286)
Dwelling Primary energy Rate (DPER)			43.0500	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.8100	(1b)	x 2.4000	(2b) =	155.5440	(1b) - (3b)
First floor	64.8100	(1c)	x 2.6000	(2c) =	168.5060	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	129.6200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		324.0500	(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)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1234 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3734 (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) =	0.3454 (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	0.4404	0.4318	0.4232	0.3800	0.3713	0.3282	0.3282	0.3195	0.3454	0.3713	0.3886	0.4059	(22b)

Effective ac	0.5970	0.5932	0.5895	0.5722	0.5689	0.5538	0.5538	0.5510	0.5597	0.5689	0.5755	0.5824 (25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.9500	1.0000	1.9500			(26)
TER Opening Type (Uw = 1.20)			24.6600	1.1450	28.2366			(27)
rl			0.7200	2.0221	1.4559			(27a)
rl			0.7200	2.0221	1.4559			(27a)
Heatloss Floor 1			64.8100	0.1300	8.4253			(28a)
External Wall 1	146.8200	22.4100	124.4100	0.1800	22.3938			(29a)
dormers	6.8000	4.2000	2.6000	0.1800	0.4680			(29a)
External Roof 1	56.1500		56.1500	0.1100	6.1765			(30)
sloping	19.8100	1.4400	18.3700	0.1100	2.0207			(30)
Total net area of external elements Aum(A, m2)			294.3900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		72.5827			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 176.9171 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	34.2600	0.1600	5.4816
E16 Corner (normal)	17.0000	0.0900	1.5300
E17 Corner (inverted - internal area greater than external area)	3.4200	-0.0900	-0.3078
E13 Gable (insulation at rafter level)	7.2000	0.0800	0.5760
E11 Eaves (insulation at rafter level)	13.7600	0.0400	0.5504
E12 Gable (insulation at ceiling level)	12.4000	0.0600	0.7440
E6 Intermediate floor within a dwelling	34.2600	0.0000	0.0000
E16 Corner (normal)	7.5600	0.0900	0.6804
R4 Ridge (vaulted ceiling)	2.7000	0.0800	0.2160
R9 Roof to wall (flat ceiling)	9.0000	0.0400	0.3600
R7 Flat ceiling (inverted)	5.4000	0.0400	0.2160
E3 Sill	18.5900	0.0500	0.9295
R11 Upstands or kerbs of rooflights	6.8000	0.0800	0.5440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.5201 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 84.1028 (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	63.8396	63.4369	63.0421	61.1880	60.8411	59.2261	59.2261	58.9271	59.8482	60.8411	61.5428	62.2765	(38)
Heat transfer coeff	147.9424	147.5397	147.1449	145.2908	144.9439	143.3289	143.3289	143.0299	143.9510	144.9439	145.6457	146.3793	(39)
Average = Sum(39)m / 12 =												145.2891	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1414	1.1382	1.1352	1.1209	1.1182	1.1058	1.1058	1.1035	1.1106	1.1182	1.1236	1.1293	(40)
HLP (average)												1.1209	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8940	(42)
Hot water usage for mixer showers	72.7427	71.6495	70.0565	67.0086	64.7594	62.2510	60.8253	62.4062	64.1392	66.8324	69.9457	72.4640	(42a)
Hot water usage for baths	31.4049	30.9385	30.2817	29.0707	28.1639	27.1584	26.6153	27.2675	27.9776	29.0536	30.2895	31.2988	(42b)
Hot water usage for other uses	44.2674	42.6577	41.0480	39.4383	37.8285	36.2188	36.2188	37.8285	39.4383	41.0480	42.6577	44.2674	(42c)
Average daily hot water use (litres/day)												136.4268	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.4151	145.2457	141.3862	135.5176	130.7518	125.6283	123.6594	127.5023	131.5551	136.9339	142.8930	148.0302	(44)
Energy conte	235.0532	206.8280	217.3054	185.5168	176.0171	154.4746	149.5553	157.8744	162.2206	185.8181	203.5772	231.7795	(45)
Energy content (annual)										Total = Sum(45)m =		2266.0203	
Distribution loss (46)m = 0.15 x (45)m	35.2580	31.0242	32.5958	27.8275	26.4026	23.1712	22.4333	23.6812	24.3331	27.8727	30.5366	34.7669	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0208	(55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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	289.9600	256.4212	272.2122	238.6525	230.9239	207.6102	204.4621	212.7812	215.3562	240.7249	256.7128	286.6863	(62)
WWHRS	-33.2549	-29.4109	-30.7974	-25.5015	-23.7665	-20.3371	-19.0628	-20.2714	-21.0416	-24.8057	-28.1018	-32.6391	(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	256.7051	227.0103	241.4148	213.1510	207.1574	187.2731	185.3993	192.5098	194.3146	215.9192	228.6110	254.0472	(64)
										Total per year (kWh/year) = Sum(64)m =		2603.5127	(64)
12Total per year (kWh/year)												2604	(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	122.0806	108.4449	116.1795	104.1928	102.4511	93.8713	93.6526	96.4187	96.4468	105.7099	110.1979	120.9921	(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	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	(66)

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

	150.7234	166.8723	150.7234	155.7475	150.7234	155.7475	150.7234	150.7234	155.7475	150.7234	155.7475	150.7234	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	297.2620	300.3466	292.5734	276.0251	255.1359	235.5030	222.3871	219.3024	227.0756	243.6239	264.5131	284.1460	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	(69)
Pumps, fans	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)													
	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	(71)
Water heating gains (Table 5)													
	164.0868	161.3763	156.1552	144.7123	137.7031	130.3768	125.8771	129.5950	133.9539	142.0833	153.0527	162.6238	(72)
Total internal gains													
	681.4822	698.0052	668.8620	645.8949	612.9724	588.0373	565.3975	566.0307	583.1870	605.8405	642.7232	666.9031	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.0100	10.6334	0.6300	0.7000	0.7700	3.2822	(74)
East	8.8100	19.6403	0.6300	0.7000	0.7700	52.8804	(76)
South	0.5600	46.7521	0.6300	0.7000	0.7700	8.0013	(78)
West	14.2800	19.6403	0.6300	0.7000	0.7700	85.7131	(80)
East	1.4400	26.0000	0.6300	0.7000	1.0000	14.8599	(82)

Solar gains	164.7370	321.3579	528.7116	772.9005	950.5072	974.8624	927.3227	794.0606	615.2689	381.0267	205.2039	135.6249	(83)
Total gains	846.2192	1019.3631	1197.5735	1418.7954	1563.4796	1562.8997	1492.7202	1360.0914	1198.4559	986.8672	847.9271	802.5281	(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	43.0573	43.1748	43.2907	43.8431	43.9480	44.4432	44.4432	44.5361	44.2512	43.9480	43.7363	43.5171	
alpha	3.8705	3.8783	3.8860	3.9229	3.9299	3.9629	3.9629	3.9691	3.9501	3.9299	3.9158	3.9011	
util living area													
	0.9895	0.9782	0.9506	0.8723	0.7342	0.5553	0.4143	0.4694	0.7171	0.9254	0.9805	0.9914	(86)
MIT	19.2397	19.5134	19.9258	20.4365	20.7832	20.9463	20.9868	20.9787	20.8547	20.3561	19.7087	19.2019	(87)
Th 2	19.9672	19.9697	19.9722	19.9838	19.9860	19.9961	19.9961	19.9980	19.9922	19.9860	19.9816	19.9770	(88)
util rest of house													
	0.9871	0.9731	0.9390	0.8440	0.6813	0.4790	0.3235	0.3734	0.6433	0.9021	0.9750	0.9894	(89)
MIT 2	17.9168	18.2654	18.7840	19.4099	19.7972	19.9615	19.9907	19.9885	19.8846	19.3322	18.5242	17.8751	(90)
Living area fraction									fLA = Living area / (4) =			0.2119	(91)
MIT	18.1972	18.5299	19.0260	19.6275	20.0062	20.1702	20.2018	20.1984	20.0902	19.5492	18.7752	18.1563	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1972	18.5299	19.0260	19.6275	20.0062	20.1702	20.2018	20.1984	20.0902	19.5492	18.7752	18.1563	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9808	0.9633	0.9254	0.8325	0.6825	0.4927	0.3425	0.3931	0.6511	0.8896	0.9660	0.9840	(94)
Useful gains	829.9732	981.9558	1108.1751	1181.1463	1067.0404	770.1034	511.1926	534.6439	780.3350	877.9470	819.1146	789.6693	(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													
	2055.9793	2010.9478	1843.1313	1558.6041	1203.9299	798.3765	516.2439	543.2794	862.2971	1297.1257	1700.4415	2042.9182	(97)
Space heating kWh													
	912.1485	691.4826	546.8074	271.7696	101.8458	0.0000	0.0000	0.0000	0.0000	311.8690	634.5554	932.4172	(98a)
Space heating requirement - total per year (kWh/year)												4402.8955	
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													
	912.1485	691.4826	546.8074	271.7696	101.8458	0.0000	0.0000	0.0000	0.0000	311.8690	634.5554	932.4172	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4402.8955	
Space heating per m2											(98c) / (4) =	33.9677	(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													
	912.1485	691.4826	546.8074	271.7696	101.8458	0.0000	0.0000	0.0000	0.0000	311.8690	634.5554	932.4172	(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)													
	988.2433	749.1686	592.4241	294.4416	110.3421	0.0000	0.0000	0.0000	0.0000	337.8862	687.4923	1010.2028	(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													
	256.7051	227.0103	241.4148	213.1510	207.1574	187.2731	185.3993	192.5098	194.3146	215.9192	228.6110	254.0472	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.6536	86.3919	85.8350	84.6057	82.5578	79.8000	79.8000	79.8000	79.8000	84.8835	86.2244	86.7061	(217)
Fuel for water heating, kWh/month													
	296.2426	262.7682	281.2543	251.9344	250.9240	234.6781	232.3300	241.2404	243.5020	254.3711	265.1348	292.9980	(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	31.3173	25.1239	22.6213	16.5733	12.8017	10.4591	11.6782	15.1797	19.7170	25.8697	29.2198	32.1877	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-57.5203	-79.5506	-112.1751	-123.6082	-131.1357	-121.5427	-119.9211	-114.1745	-103.8402	-89.6424	-62.6369	-49.9023	(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	-37.3743	-78.0054	-153.9601	-229.7378	-302.4007	-303.4380	-299.9756	-254.7098	-187.5834	-111.1829	-49.7667	-29.6118	(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	4770.2010	(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	3107.3779	(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)	252.7489	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3203.3966	(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	5012.9311	(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	4770.2010	0.2100	1001.7422	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3107.3779	0.2100	652.5494	(264)
Space and water heating			1654.2916	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	252.7489	0.1443	36.4795	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1165.6501	0.1350	-157.3886	
PV Unit electricity exported	-2037.7465	0.1261	-256.9207	
Total			-414.3093	(269)
Total CO2, kg/year			1288.3910	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9400	(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	4770.2010	1.1300	5390.3271	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3107.3779	1.1300	3511.3370	(278)
Space and water heating			8901.6641	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	252.7489	1.5338	387.6746	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1165.6501	1.4990	-1747.3602	
PV Unit electricity exported	-2037.7465	0.4628	-943.0914	
Total			-2690.4516	(283)
Total Primary energy kWh/year			6728.9879	(286)
Target Primary Energy Rate (TPER)			51.9100	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 2	Assessment Date	27/09/2024
Property Reference (cont.)	00001	Date of Test(s)	
Address	Plot 2 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

DER Rating	79 C	DER	4.33	TER	8.80
Environmental	96 A	% DER < TER			50.80
CO2 Emissions (t/year)	0.57	DFEE	43.41	TFEE	51.67
Compliance Check	See BREL	% DFEE < TFEE			15.98
Assessor's Name	7.65	DPER	45.07	TPER	48.80

Assessor Name	Mr. Neil Rothon	Accreditation	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	151.8100	(1b)	x 2.7900	(2b) =	423.5499	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	151.8100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		423.5499	(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	5 * 10 =	50.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) =	0.1180	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2680	(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) =	0.2278	(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	0.2905	0.2848	0.2791	0.2506	0.2449	0.2165	0.2165	0.2108	0.2278	0.2449	0.2563	0.2677	(22b)
Effective ac	0.5422	0.5406	0.5390	0.5314	0.5300	0.5234	0.5234	0.5222	0.5260	0.5300	0.5329	0.5358	(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	
Front door			1.9500	1.2000	2.3400			(26)
side door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			26.1300	1.1450	29.9198			(27)
Heatloss Floor 1			151.8100	0.1000	15.1810	75.0000	11385.7500	(28a)
External Wall 1	184.4700	30.0300	154.4400	0.1500	23.1660	110.0000	16988.4000	(29a)
External Roof 1	110.2100		110.2100	0.1200	13.2252	9.0000	991.8900	(30)
sloping	48.8300		48.8300	0.1600	7.8128	9.0000	439.4700	(30)
Total net area of external elements Aum(A, m2)			495.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		93.9848			(33)
Internal Wall 1			192.7600			9.0000	1734.8400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	31540.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		207.7620 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	21.0400	0.0310	0.6522
E3 Sill	12.6800	0.0290	0.3677
E4 Jamb	49.2200	0.0240	1.1813
E5 Ground floor (normal)	69.9800	0.0590	4.1288
E16 Corner (normal)	24.0000	0.0350	0.8400

E17 Corner (inverted - internal area greater than external area)	14.4000	-0.0660	-0.9504	
E13 Gable (insulation at rafter level)	16.4000	0.0420	0.6888	
E11 Eaves (insulation at rafter level)	8.1600	0.0220	0.1795	
R4 Ridge (vaulted ceiling)	7.2000	0.1200	0.8640	
E12 Gable (insulation at ceiling level)	11.6200	0.0410	0.4764	
E10 Eaves (insulation at ceiling level)	37.7800	0.0640	2.4179	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.8463 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 104.8312 (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	75.7834	75.5544	75.3299	74.2755	74.0782	73.1599	73.1599	72.9899	73.5137	74.0782	74.4773	74.8945	(38)
Heat transfer coeff	180.6145	180.3855	180.1610	179.1067	178.9094	177.9911	177.9911	177.8210	178.3448	178.9094	179.3085	179.7257	(39)
Average = Sum(39)m / 12 =												179.1057	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1897	1.1882	1.1868	1.1798	1.1785	1.1725	1.1725	1.1713	1.1748	1.1785	1.1811	1.1839	(40)
HLP (average)												1.1798	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9370 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.4633	72.3593	70.7505	67.6725	65.4009	62.8677	61.4278	63.0244	64.7746	67.4945	70.6387	73.1818	(42a)
Hot water usage for baths	31.7148	31.2438	30.5806	29.3576	28.4418	27.4264	26.8779	27.5366	28.2537	29.3403	30.5884	31.6076	(42b)
Hot water usage for other uses	44.7076	43.0819	41.4561	39.8304	38.2047	36.5789	36.5789	38.2047	39.8304	41.4561	43.0819	44.7076	(42c)
Average daily hot water use (litres/day)												137.7786	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.8857	146.6850	142.7872	136.8604	132.0474	126.8731	124.8847	128.7657	132.8587	138.2908	144.3089	149.4970	(44)
Energy conte	237.3824	208.8774	219.4586	187.3551	177.7612	156.0052	151.0372	159.4388	163.8281	187.6594	205.5945	234.0762	(45)
Energy content (annual)										Total = Sum(45)m =		2288.4742	
Distribution loss (46)m = 0.15 x (45)m	35.6074	31.3316	32.9188	28.1033	26.6642	23.4008	22.6556	23.9158	24.5742	28.1489	30.8392	35.1114	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9720	(55)
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(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	290.7768	257.1046	272.8530	239.0271	231.1556	207.6772	204.4316	212.8332	215.5001	241.0538	257.2665	287.4706	(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	290.7768	257.1046	272.8530	239.0271	231.1556	207.6772	204.4316	212.8332	215.5001	241.0538	257.2665	287.4706	(64)
									Total per year (kWh/year) = Sum(64)m =			2917.1502	(64)
12Total per year (kWh/year)												2917	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							0.0000	(64a)
Heat gains from water heating, kWh/month	121.6452	108.0335	115.6855	103.6332	101.8211	93.2093	92.9354	95.7289	95.8104	105.1123	109.6978	120.5459	(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	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	167.3868	185.3210	167.3868	172.9663	167.3868	172.9663	167.3868	167.3868	172.9663	167.3868	172.9663	167.3868	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.4845	325.8309	317.3981	299.4457	276.7841	255.4853	241.2565	237.9101	246.3429	264.2952	286.9569	308.2556	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	(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)	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	(71)
Water heating gains (Table 5)	163.5015	160.7642	155.4913	143.9350	136.8563	129.4574	124.9132	128.6679	133.0700	141.2799	152.3580	162.0240	(72)
Total internal gains	720.4274	738.9707	707.3308	683.4016	648.0818	624.9637	600.6111	601.0194	619.4339	640.0166	679.3359	704.7210	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	0.3600	10.6334	0.7200	0.7000	0.7700	1.3370	(74)
East	8.7500	19.6403	0.7200	0.7000	0.7700	60.0232	(76)
South	9.3700	46.7521	0.7200	0.7000	0.7700	153.0045	(78)
West	7.6500	19.6403	0.7200	0.7000	0.7700	52.4774	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	266.8421	473.2121	685.9710	896.3217	1033.1326	1034.9851	994.2148	893.0446	760.1829	534.4553	323.2869	225.8396	(83)
Total gains	987.2696	1212.1828	1393.3018	1579.7234	1681.2145	1659.9488	1594.8258	1494.0640	1379.6167	1174.4718	1002.6228	930.5606	(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	48.5078	48.5694	48.6299	48.9161	48.9701	49.2227	49.2227	49.2698	49.1251	48.9701	48.8611	48.7477	
alpha	4.2339	4.2380	4.2420	4.2611	4.2647	4.2815	4.2815	4.2847	4.2750	4.2647	4.2574	4.2498	
util living area													
	0.9940	0.9855	0.9663	0.9131	0.8058	0.6365	0.4789	0.5279	0.7615	0.9431	0.9875	0.9953	(86)
Living	19.3554	19.6178	19.9762	20.4130	20.7496	20.9330	20.9842	20.9763	20.8540	20.3900	19.7836	19.3062	
Non living	18.0169	18.3511	18.8030	19.3405	19.7217	19.9010	19.9364	19.9335	19.8369	19.3259	18.5684	17.9573	
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	20.1587	19.6178	19.9762	20.4130	20.7496	20.9330	20.9842	20.9763	20.8540	20.3900	19.7836	19.5431	(87)
Th 2	19.9282	19.9294	19.9306	19.9362	19.9372	19.9421	19.9421	19.9430	19.9402	19.9372	19.9351	19.9329	(88)
util rest of house													
	0.9924	0.9815	0.9568	0.8884	0.7532	0.5490	0.3695	0.4156	0.6830	0.9216	0.9834	0.9940	(89)
MIT 2	19.1662	18.3511	18.8030	19.3405	19.7217	19.9010	19.9364	19.9335	19.8369	19.3259	18.5684	18.3133	(90)
Living area fraction										fLA = Living area / (4) =		0.3844	(91)
MIT	19.5478	18.8381	19.2540	19.7528	20.1168	20.2977	20.3392	20.3344	20.2279	19.7350	19.0356	18.7861	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5478	18.8381	19.2540	19.7528	20.1168	20.2977	20.3392	20.3344	20.2279	19.7350	19.0356	18.7861	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9916	0.9760	0.9492	0.8835	0.7630	0.5798	0.4115	0.4584	0.7062	0.9166	0.9785	0.9921	(94)
Useful gains	979.0018	1183.0309	1322.4659	1395.6261	1282.7272	962.4673	656.2563	684.9387	974.2917	1076.5182	981.1046	923.1711	(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													
	2753.9654	2514.2270	2297.7788	1943.8080	1505.8527	1014.1472	665.5447	699.6169	1092.8831	1634.3327	2140.1455	2621.4926	(97)
Space heating kWh													
	1320.5729	894.5638	725.6328	394.6910	166.0054	0.0000	0.0000	0.0000	0.0000	415.0140	834.5094	1263.5513	(98a)
Space heating requirement - total per year (kWh/year)												6014.5405	
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													
	1320.5729	894.5638	725.6328	394.6910	166.0054	0.0000	0.0000	0.0000	0.0000	415.0140	834.5094	1263.5513	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6014.5405	
Space heating per m2											(98c) / (4) =	39.6189	(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 %)	253.2005	(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													
	1320.5729	894.5638	725.6328	394.6910	166.0054	0.0000	0.0000	0.0000	0.0000	415.0140	834.5094	1263.5513	(98)
Space heating efficiency (main heating system 1)													
	253.2005	253.2005	253.2005	253.2005	253.2005	0.0000	0.0000	0.0000	0.0000	253.2005	253.2005	253.2005	(210)
Space heating fuel (main heating system)													
	521.5522	353.3025	286.5842	155.8808	65.5628	0.0000	0.0000	0.0000	0.0000	163.9073	329.5844	499.0319	(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													
	290.7768	257.1046	272.8530	239.0271	231.1556	207.6772	204.4316	212.8332	215.5001	241.0538	257.2665	287.4706	(64)
Efficiency of water heater												171.7340	(216)
(217)m	171.7340	171.7340	171.7340	171.7340	171.7340	171.7340	171.7340	171.7340	171.7340	171.7340	171.7340	171.7340	(217)
Fuel for water heating, kWh/month													
	169.3181	149.7109	158.8812	139.1845	134.6009	120.9296	119.0397	123.9319	125.4848	140.3646	149.8052	167.3929	(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	41.4974	33.2907	29.9746	21.9607	16.9631	13.8590	15.4743	20.1141	26.1262	34.2789	38.7180	42.6507	(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	2375.4061	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	171.7340	
Water heating fuel used	1698.6442	(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)	334.9076	(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	4408.9578	(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	2375.4061	0.1557	369.7349	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1698.6442	0.1410	239.4418	(264)
Space and water heating			609.1767	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	334.9076	0.1443	48.3375	(268)
Total CO2, kg/year			657.5142	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2375.4061	1.5762	3744.1472	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1698.6442	1.5212	2584.0183	(278)
Space and water heating			6328.1655	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	334.9076	1.5338	513.6925	(282)
Total Primary energy kWh/year			6841.8580	(286)
Dwelling Primary energy Rate (DPER)			45.0700	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		151.8100	(1b)	x 2.7900	(2b) =	423.5499	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	151.8100						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		423.5499	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0944	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3444	(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) =	0.2928	(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	0.3733	0.3660	0.3586	0.3221	0.3147	0.2781	0.2781	0.2708	0.2928	0.3147	0.3294	0.3440	(22b)
Effective ac	0.5697	0.5670	0.5643	0.5519	0.5495	0.5387	0.5387	0.5367	0.5429	0.5495	0.5542	0.5592	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			3.9000	1.0000	3.9000			(26)
TER Opening Type (Uw = 1.20)			26.1300	1.1450	29.9198			(27)
Heatloss Floor 1			151.8100	0.1300	19.7353			(28a)
External Wall 1	184.4700	30.0300	154.4400	0.1800	27.7992			(29a)
External Roof 1	110.2100		110.2100	0.1100	12.1231			(30)
sloping	48.8300		48.8300	0.1100	5.3713			(30)
Total net area of external elements Aum(A, m2)			495.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		98.8487			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 207.7620 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	21.0400	0.0500	1.0520
E3 Sill	12.6800	0.0500	0.6340
E4 Jamb	49.2200	0.0500	2.4610
E5 Ground floor (normal)	69.9800	0.1600	11.1968
E16 Corner (normal)	24.0000	0.0900	2.1600
E17 Corner (inverted - internal area greater than external area)	14.4000	-0.0900	-1.2960
E13 Gable (insulation at rafter level)	16.4000	0.0800	1.3120
E11 Eaves (insulation at rafter level)	8.1600	0.0400	0.3264
R4 Ridge (vaulted ceiling)	7.2000	0.0800	0.5760
E12 Gable (insulation at ceiling level)	11.6200	0.0600	0.6972
E10 Eaves (insulation at ceiling level)	37.7800	0.0600	2.2668

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.3862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 120.2349 (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	79.6238	79.2457	78.8750	77.1341	76.8083	75.2920	75.2920	75.0112	75.8761	76.8083	77.4673	78.1562	(38)
Heat transfer coeff	199.8588	199.4806	199.1100	197.3690	197.0433	195.5270	195.5270	195.2462	196.1110	197.0433	197.7022	198.3911	(39)
Average = Sum(39)m / 12 =												197.3675	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3165	1.3140	1.3116	1.3001	1.2980	1.2880	1.2880	1.2861	1.2918	1.2980	1.3023	1.3068	(40)
HLP (average)												1.3001	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9370 (42)

Hot water usage for mixer showers												
	73.4633	72.3593	70.7505	67.6725	65.4009	62.8677	61.4278	63.0244	64.7746	67.4945	70.6387	73.1818 (42a)
Hot water usage for baths												
	31.7148	31.2438	30.5806	29.3576	28.4418	27.4264	26.8779	27.5366	28.2537	29.3403	30.5884	31.6076 (42b)
Hot water usage for other uses												
	44.7076	43.0819	41.4561	39.8304	38.2047	36.5789	36.5789	38.2047	39.8304	41.4561	43.0819	44.7076 (42c)
Average daily hot water use (litres/day)												137.7786 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	149.8857	146.6850	142.7872	136.8604	132.0474	126.8731	124.8847	128.7657	132.8587	138.2908	144.3089	149.4970	(44)
Energy conte	237.3824	208.8774	219.4586	187.3551	177.7612	156.0052	151.0372	159.4388	163.8281	187.6594	205.5945	234.0762	(45)
Energy content (annual)										Total = Sum(45)m =		2288.4742	
Distribution loss (46)m = 0.15 x (45)m													
	35.6074	31.3316	32.9188	28.1033	26.6642	23.4008	22.6556	23.9158	24.5742	28.1489	30.8392	35.1114	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0208	(55)
Total storage loss													
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage													
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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													
	292.2891	258.4707	274.3654	240.4907	232.6680	209.1408	205.9440	214.3456	216.9637	242.5662	258.7301	288.9830	(62)
WWHRS	-33.5844	-29.7023	-31.1025	-25.7541	-24.0019	-20.5386	-19.2517	-20.4722	-21.2500	-25.0514	-28.3802	-32.9624	(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													
	258.7048	228.7684	243.2629	214.7366	208.6661	188.6022	186.6924	193.8734	195.7136	217.5147	230.3499	256.0206	(64)
										Total per year (kWh/year) = Sum(64)m =		2622.9056	(64)
12Total per year (kWh/year)												2623	(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													
	122.8551	109.1263	116.8954	104.8041	103.0310	94.3802	94.1453	96.9388	96.9813	106.3222	110.8687	121.7558	(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	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	167.3868	185.3210	167.3868	172.9663	167.3868	172.9663	167.3868	167.3868	172.9663	167.3868	172.9663	167.3868	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.4845	325.8309	317.3981	299.4457	276.7841	255.4853	241.2565	237.9101	246.3429	264.2952	286.9569	308.2556	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	(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)	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	(71)
Water heating gains (Table 5)	165.1278	162.3904	157.1175	145.5612	138.4826	131.0836	126.5394	130.2941	134.6963	142.9061	153.9842	163.6502	(72)
Total internal gains	725.0537	743.5969	711.9570	688.0279	652.7081	626.5900	602.2373	602.6456	621.0601	644.6428	683.9621	709.3473	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	0.3600	10.6334	0.6300	0.7000	0.7700	1.1699	(74)
East	8.7500	19.6403	0.6300	0.7000	0.7700	52.5203	(76)
South	9.3700	46.7521	0.6300	0.7000	0.7700	133.8789	(78)
West	7.6500	19.6403	0.6300	0.7000	0.7700	45.9177	(80)

Solar gains	233.4869	414.0606	600.2246	784.2815	903.9910	905.6119	869.9379	781.4140	665.1600	467.6484	282.8761	197.6097	(83)
Total gains	958.5405	1157.6575	1312.1816	1472.3094	1556.6991	1532.2019	1472.1752	1384.0596	1286.2201	1112.2911	966.8381	906.9569	(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	43.8370	43.9201	44.0019	44.3900	44.4634	44.8082	44.8082	44.8726	44.6747	44.4634	44.3152	44.1613	
alpha	3.9225	3.9280	3.9335	3.9593	3.9642	3.9872	3.9872	3.9915	3.9783	3.9642	3.9543	3.9441	
util living area	0.9946	0.9883	0.9750	0.9379	0.8580	0.7117	0.5538	0.6031	0.8189	0.9574	0.9895	0.9957	(86)
MIT	19.1226	19.3712	19.7327	20.2041	20.6072	20.8725	20.9643	20.9497	20.7627	20.2220	19.5854	19.0829	(87)
Th 2	19.8279	19.8299	19.8318	19.8408	19.8424	19.8503	19.8503	19.8517	19.8472	19.8424	19.8390	19.8355	(88)
util rest of house	0.9931	0.9849	0.9673	0.9179	0.8104	0.6182	0.4229	0.4724	0.7432	0.9397	0.9859	0.9944	(89)
MIT 2	17.6541	17.9718	18.4308	19.0216	19.4947	19.7696	19.8372	19.8313	19.6735	19.0554	18.2528	17.6082	(90)
Living area fraction									fLA = Living area / (4) =			0.3844	(91)
MIT	18.2186	18.5098	18.9313	19.4762	19.9224	20.1936	20.2705	20.2612	20.0922	19.5039	18.7651	18.1751	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2186	18.5098	18.9313	19.4762	19.9224	20.1936	20.2705	20.2612	20.0922	19.5039	18.7651	18.1751	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9899	0.9795	0.9595	0.9101	0.8142	0.6484	0.4728	0.5216	0.7615	0.9329	0.9811	0.9918	(94)
Useful gains	948.8696	1133.9599	1259.0636	1339.9680	1267.4528	993.4234	696.1130	721.9829	979.4884	1037.6711	948.5445	899.4885	(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	2781.7587	2714.8825	2475.1980	2087.4189	1620.1717	1093.6975	717.6773	753.8926	1175.1332	1754.4470	2306.2179	2772.5384	(97)
Space heating kWh	1363.6695	1062.3800	904.8040	538.1646	262.4229	0.0000	0.0000	0.0000	0.0000	533.2812	977.5248	1393.5491	(98a)
Space heating requirement - total per year (kWh/year)												7035.7961	
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	1363.6695	1062.3800	904.8040	538.1646	262.4229	0.0000	0.0000	0.0000	0.0000	533.2812	977.5248	1393.5491	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7035.7961	
Space heating per m2											(98c) / (4) =	46.3461	(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	1363.6695	1062.3800	904.8040	538.1646	262.4229	0.0000	0.0000	0.0000	0.0000	533.2812	977.5248	1393.5491	(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)	1477.4317	1151.0076	980.2860	583.0603	284.3152	0.0000	0.0000	0.0000	0.0000	577.7695	1059.0735	1509.8040	(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	258.7048	228.7684	243.2629	214.7366	208.6661	188.6022	186.6924	193.8734	195.7136	217.5147	230.3499	256.0206	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2312	87.0603	86.7275	86.0326	84.5750	79.8000	79.8000	79.8000	79.8000	85.9903	86.9303	87.2724	(217)
Fuel for water heating, kWh/month	296.5737	262.7701	280.4912	249.5991	246.7232	236.3437	233.9503	242.9491	245.2552	252.9526	264.9823	293.3582	(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	34.7797	27.9015	25.1222	18.4056	14.2170	11.6154	12.9693	16.8579	21.8968	28.7298	32.4502	35.7463	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-105.7293	-133.8243	-172.8520	-173.9275	-171.8403	-154.9096	-152.7103	-151.2312	-147.3661	-141.9932	-110.5191	-93.2819	(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	-116.5504	-235.2327	-450.5392	-653.7452	-843.6691	-840.5590	-830.8497	-712.8380	-535.2604	-328.4169	-152.7736	-92.9708	(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	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	7622.7477	(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	3105.9487	(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)	280.6918	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-7503.5896	(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	3591.7986	(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	7622.7477	0.2100	1600.7770	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3105.9487	0.2100	652.2492	(264)
Space and water heating			2253.0262	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	280.6918	0.1443	40.5125	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1710.1847	0.1370	-234.3076	
PV Unit electricity exported	-5793.4049	0.1269	-735.4043	
Total			-969.7119	(269)
Total CO2, kg/year			1335.7561	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.8000	(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	7622.7477	1.1300	8613.7049	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3105.9487	1.1300	3509.7220	(278)
Space and water heating			12123.4269	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	280.6918	1.5338	430.5344	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1710.1847	1.5065	-2576.3679	
PV Unit electricity exported	-5793.4049	0.4660	-2699.6966	
Total			-5276.0645	(283)
Total Primary energy kWh/year			7407.9977	(286)
Target Primary Energy Rate (TPER)			48.8000	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 3	Assessment Date	27/09/2024
Property Reference (cont.)	00001	Date Built Date	
Address	Plot 3 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

DER Rating	78 C	DER	4.56	TER	9.57
Environmental	95 A	% DER < TER			52.35
CO2 Emissions (tonnes)	0.6	DFEE	47.13	TFEE	55.10
Compliance Check	See BREL	% DFEE < TFEE			14.45
Assessor's Name	10.40	DPER	47.44	TPER	52.94

Assessor Name	Mr. Neil Rothon	Accreditation	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor		151.8100	(1b)	x 2.7900	(2b) =	423.5499	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	151.8100						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		423.5499	(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	5 * 10 =	50.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) =	0.1180	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2680	(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) =	0.2278	(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	0.2905	0.2848	0.2791	0.2506	0.2449	0.2165	0.2165	0.2108	0.2278	0.2449	0.2563	0.2677	(22b)
Effective ac	0.5422	0.5406	0.5390	0.5314	0.5300	0.5234	0.5234	0.5222	0.5260	0.5300	0.5329	0.5358	(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	
Front door			1.9500	1.2000	2.3400			(26)
side door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			26.1300	1.1450	29.9198			(27)
Heatloss Floor 1			151.8100	0.1000	15.1810	75.0000	11385.7500	(28a)
External Wall 1	184.4700	30.0300	154.4400	0.1500	23.1660	110.0000	16988.4000	(29a)
External Roof 1	110.2100		110.2100	0.1200	13.2252	9.0000	991.8900	(30)
sloping	48.8300		48.8300	0.1600	7.8128	9.0000	439.4700	(30)
Total net area of external elements Aum(A, m2)			495.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		93.9848			(33)
Internal Wall 1			192.7600			9.0000	1734.8400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	31540.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		207.7620 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	21.0400	0.0310	0.6522
E3 Sill	12.6800	0.0290	0.3677
E4 Jamb	49.2200	0.0240	1.1813
E5 Ground floor (normal)	69.9800	0.0590	4.1288
E16 Corner (normal)	24.0000	0.0350	0.8400

E17 Corner (inverted - internal area greater than external area)	14.4000	-0.0660	-0.9504		
E13 Gable (insulation at rafter level)	16.4000	0.0420	0.6888		
E11 Eaves (insulation at rafter level)	8.1600	0.0220	0.1795		
R4 Ridge (vaulted ceiling)	7.2000	0.1200	0.8640		
E12 Gable (insulation at ceiling level)	11.6200	0.0410	0.4764		
E10 Eaves (insulation at ceiling level)	37.7800	0.0640	2.4179		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				10.8463	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	104.8312	(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	75.7834	75.5544	75.3299	74.2755	74.0782	73.1599	73.1599	72.9899	73.5137	74.0782	74.4773	74.8945	(38)
Heat transfer coeff	180.6145	180.3855	180.1610	179.1067	178.9094	177.9911	177.9911	177.8210	178.3448	178.9094	179.3085	179.7257	(39)
Average = Sum(39)m / 12 =												179.1057	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1897	1.1882	1.1868	1.1798	1.1785	1.1725	1.1725	1.1713	1.1748	1.1785	1.1811	1.1839	(40)
HLP (average)												1.1798	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9370	(42)
Hot water usage for mixer showers	73.4633	72.3593	70.7505	67.6725	65.4009	62.8677	61.4278	63.0244	64.7746	67.4945	70.6387	73.1818	(42a)
Hot water usage for baths	31.7148	31.2438	30.5806	29.3576	28.4418	27.4264	26.8779	27.5366	28.2537	29.3403	30.5884	31.6076	(42b)
Hot water usage for other uses	44.7076	43.0819	41.4561	39.8304	38.2047	36.5789	36.5789	38.2047	39.8304	41.4561	43.0819	44.7076	(42c)
Average daily hot water use (litres/day)												137.7786	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.8857	146.6850	142.7872	136.8604	132.0474	126.8731	124.8847	128.7657	132.8587	138.2908	144.3089	149.4970	(44)
Energy conte	237.3824	208.8774	219.4586	187.3551	177.7612	156.0052	151.0372	159.4388	163.8281	187.6594	205.5945	234.0762	(45)
Energy content (annual)										Total = Sum(45)m =		2288.4742	
Distribution loss (46)m = 0.15 x (45)m	35.6074	31.3316	32.9188	28.1033	26.6642	23.4008	22.6556	23.9158	24.5742	28.1489	30.8392	35.1114	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9720	(55)
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(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	290.7768	257.1046	272.8530	239.0271	231.1556	207.6772	204.4316	212.8332	215.5001	241.0538	257.2665	287.4706	(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	290.7768	257.1046	272.8530	239.0271	231.1556	207.6772	204.4316	212.8332	215.5001	241.0538	257.2665	287.4706	(64)
									Total per year (kWh/year) = Sum(64)m =			2917.1502	(64)
12Total per year (kWh/year)												2917	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							0.0000	(64a)
Heat gains from water heating, kWh/month	121.6452	108.0335	115.6855	103.6332	101.8211	93.2093	92.9354	95.7289	95.8104	105.1123	109.6978	120.5459	(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	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	167.3868	185.3210	167.3868	172.9663	167.3868	172.9663	167.3868	167.3868	172.9663	167.3868	172.9663	167.3868	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.4845	325.8309	317.3981	299.4457	276.7841	255.4853	241.2565	237.9101	246.3429	264.2952	286.9569	308.2556	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	(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)	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	(71)
Water heating gains (Table 5)	163.5015	160.7642	155.4913	143.9350	136.8563	129.4574	124.9132	128.6679	133.0700	141.2799	152.3580	162.0240	(72)
Total internal gains	720.4274	738.9707	707.3308	683.4016	648.0818	624.9637	600.6111	601.0194	619.4339	640.0166	679.3359	704.7210	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.3700	10.6334	0.7200	0.7000	0.7700	34.7997	(74)
East	8.7500	19.6403	0.7200	0.7000	0.7700	60.0232	(76)
South	0.3600	46.7521	0.7200	0.7000	0.7700	5.8785	(78)
West	7.6500	19.6403	0.7200	0.7000	0.7700	52.4774	(80)

Solar gains	153.1788	296.2065	487.7025	723.9640	906.7661	938.8071	889.3105	749.3925	570.2051	350.6861	190.1730	126.6053	(83)
Total gains	873.6062	1035.1772	1195.0333	1407.3656	1554.8479	1563.7708	1489.9215	1350.4119	1189.6390	990.7026	869.5088	831.3264	(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	48.5078	48.5694	48.6299	48.9161	48.9701	49.2227	49.2227	49.2698	49.1251	48.9701	48.8611	48.7477	
alpha	4.2339	4.2380	4.2420	4.2611	4.2647	4.2815	4.2815	4.2847	4.2750	4.2647	4.2574	4.2498	
util living area													
	0.9963	0.9918	0.9800	0.9379	0.8364	0.6657	0.5092	0.5757	0.8239	0.9670	0.9926	0.9970	(86)
Living	19.2656	19.4821	19.8345	20.3138	20.7057	20.9204	20.9801	20.9671	20.7969	20.2687	19.6808	19.2274	
Non living	17.9024	18.1795	18.6275	19.2256	19.6785	19.8924	19.9347	19.9294	19.7886	19.1823	18.4384	17.8567	
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	20.1128	19.4821	19.8345	20.3138	20.7057	20.9204	20.9801	20.9671	20.7969	20.2687	19.6808	19.4753	(87)
Th 2	19.9282	19.9294	19.9306	19.9362	19.9372	19.9421	19.9421	19.9430	19.9402	19.9372	19.9351	19.9329	(88)
util rest of house													
	0.9952	0.9895	0.9740	0.9186	0.7877	0.5775	0.3945	0.4569	0.7530	0.9532	0.9901	0.9961	(89)
MIT 2	19.1206	18.1795	18.6275	19.2256	19.6785	19.8924	19.9347	19.9294	19.7886	19.1823	18.4384	18.2308	(90)
Living area fraction									fLA = Living area / (4) =			0.3844	(91)
MIT	19.5020	18.6802	19.0915	19.6439	20.0734	20.2876	20.3366	20.3283	20.1762	19.6000	18.9160	18.7092	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5020	18.6802	19.0915	19.6439	20.0734	20.2876	20.3366	20.3283	20.1762	19.6000	18.9160	18.7092	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9946	0.9856	0.9677	0.9122	0.7947	0.6079	0.4385	0.5020	0.7708	0.9474	0.9866	0.9947	(94)
Useful gains	868.9244	1020.2757	1156.3970	1283.8644	1235.6244	950.6643	653.2683	677.8955	917.0011	938.6317	857.8376	826.9193	(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													
	2745.7055	2485.7571	2268.4916	1924.3072	1498.0742	1012.3452	665.0852	698.5420	1083.6664	1610.1784	2118.7128	2607.6820	(97)
Space heating kWh													
	1396.3252	984.8035	827.3984	461.1188	195.2627	0.0000	0.0000	0.0000	0.0000	499.6308	907.8301	1324.8875	(98a)
Space heating requirement - total per year (kWh/year)												6597.2569	
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													
	1396.3252	984.8035	827.3984	461.1188	195.2627	0.0000	0.0000	0.0000	0.0000	499.6308	907.8301	1324.8875	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6597.2569	
Space heating per m2											(98c) / (4) =	43.4573	(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 %) 253.2005 (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													
	1396.3252	984.8035	827.3984	461.1188	195.2627	0.0000	0.0000	0.0000	0.0000	499.6308	907.8301	1324.8875	(98)
Space heating efficiency (main heating system 1)													
	253.2005	253.2005	253.2005	253.2005	253.2005	0.0000	0.0000	0.0000	0.0000	253.2005	253.2005	253.2005	(210)
Space heating fuel (main heating system)													
	551.4701	388.9421	326.7760	182.1161	77.1178	0.0000	0.0000	0.0000	0.0000	197.3261	358.5420	523.2562	(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													
	290.7768	257.1046	272.8530	239.0271	231.1556	207.6772	204.4316	212.8332	215.5001	241.0538	257.2665	287.4706	(64)
Efficiency of water heater												171.7340	(216)
(217)m	171.7340	171.7340	171.7340	171.7340	171.7340	171.7340	171.7340	171.7340	171.7340	171.7340	171.7340	171.7340	(217)
Fuel for water heating, kWh/month													
	169.3181	149.7109	158.8812	139.1845	134.6009	120.9296	119.0397	123.9319	125.4848	140.3646	149.8052	167.3929	(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	41.4974	33.2907	29.9746	21.9607	16.9631	13.8590	15.4743	20.1141	26.1262	34.2789	38.7180	42.6507	(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 2605.5464 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 171.7340

Water heating fuel used 1698.6442 (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)	334.9076	(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	4639.0981	(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	2605.5464	0.1553	404.6062	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1698.6442	0.1410	239.4418	(264)
Space and water heating			644.0480	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	334.9076	0.1443	48.3375	(268)
Total CO2, kg/year			692.3855	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5600	(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	2605.5464	1.5749	4103.4262	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1698.6442	1.5212	2584.0183	(278)
Space and water heating			6687.4445	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	334.9076	1.5338	513.6925	(282)
Total Primary energy kWh/year			7201.1369	(286)
Dwelling Primary energy Rate (DPER)			47.4400	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		151.8100	(1b)	x 2.7900	(2b) =	423.5499	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	151.8100						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		423.5499	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0944	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3444	(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) =	0.2928	(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	0.3733	0.3660	0.3586	0.3221	0.3147	0.2781	0.2781	0.2708	0.2928	0.3147	0.3294	0.3440	(22b)
Effective ac	0.5697	0.5670	0.5643	0.5519	0.5495	0.5387	0.5387	0.5367	0.5429	0.5495	0.5542	0.5592	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			3.9000	1.0000	3.9000			(26)
TER Opening Type (Uw = 1.20)			26.1300	1.1450	29.9198			(27)
Heatloss Floor 1			151.8100	0.1300	19.7353			(28a)
External Wall 1	184.4700	30.0300	154.4400	0.1800	27.7992			(29a)
External Roof 1	110.2100		110.2100	0.1100	12.1231			(30)
sloping	48.8300		48.8300	0.1100	5.3713			(30)
Total net area of external elements Aum(A, m2)			495.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		98.8487			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 207.7620 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	21.0400	0.0500	1.0520
E3 Sill	12.6800	0.0500	0.6340
E4 Jamb	49.2200	0.0500	2.4610
E5 Ground floor (normal)	69.9800	0.1600	11.1968
E16 Corner (normal)	24.0000	0.0900	2.1600
E17 Corner (inverted - internal area greater than external area)	14.4000	-0.0900	-1.2960
E13 Gable (insulation at rafter level)	16.4000	0.0800	1.3120
E11 Eaves (insulation at rafter level)	8.1600	0.0400	0.3264
R4 Ridge (vaulted ceiling)	7.2000	0.0800	0.5760
E12 Gable (insulation at ceiling level)	11.6200	0.0600	0.6972
E10 Eaves (insulation at ceiling level)	37.7800	0.0600	2.2668

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.3862 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 120.2349 (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	79.6238	79.2457	78.8750	77.1341	76.8083	75.2920	75.2920	75.0112	75.8761	76.8083	77.4673	78.1562	(38)
Heat transfer coeff	199.8588	199.4806	199.1100	197.3690	197.0433	195.5270	195.5270	195.2462	196.1110	197.0433	197.7022	198.3911	(39)
Average = Sum(39)m / 12 =												197.3675	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3165	1.3140	1.3116	1.3001	1.2980	1.2880	1.2880	1.2861	1.2918	1.2980	1.3023	1.3068	(40)
HLP (average)												1.3001	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9370 (42)

Hot water usage for mixer showers												
	73.4633	72.3593	70.7505	67.6725	65.4009	62.8677	61.4278	63.0244	64.7746	67.4945	70.6387	73.1818 (42a)
Hot water usage for baths												
	31.7148	31.2438	30.5806	29.3576	28.4418	27.4264	26.8779	27.5366	28.2537	29.3403	30.5884	31.6076 (42b)
Hot water usage for other uses												
	44.7076	43.0819	41.4561	39.8304	38.2047	36.5789	36.5789	38.2047	39.8304	41.4561	43.0819	44.7076 (42c)
Average daily hot water use (litres/day)												137.7786 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	149.8857	146.6850	142.7872	136.8604	132.0474	126.8731	124.8847	128.7657	132.8587	138.2908	144.3089	149.4970	(44)
Energy conte	237.3824	208.8774	219.4586	187.3551	177.7612	156.0052	151.0372	159.4388	163.8281	187.6594	205.5945	234.0762	(45)
Energy content (annual)										Total = Sum(45)m =		2288.4742	
Distribution loss (46)m = 0.15 x (45)m													
	35.6074	31.3316	32.9188	28.1033	26.6642	23.4008	22.6556	23.9158	24.5742	28.1489	30.8392	35.1114	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0208	(55)
Total storage loss													
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage													
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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													
	292.2891	258.4707	274.3654	240.4907	232.6680	209.1408	205.9440	214.3456	216.9637	242.5662	258.7301	288.9830	(62)
WWHRS	-33.5844	-29.7023	-31.1025	-25.7541	-24.0019	-20.5386	-19.2517	-20.4722	-21.2500	-25.0514	-28.3802	-32.9624	(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													
	258.7048	228.7684	243.2629	214.7366	208.6661	188.6022	186.6924	193.8734	195.7136	217.5147	230.3499	256.0206	(64)
										Total per year (kWh/year) = Sum(64)m =		2622.9056	(64)
12Total per year (kWh/year)												2623	(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													
	122.8551	109.1263	116.8954	104.8041	103.0310	94.3802	94.1453	96.9388	96.9813	106.3222	110.8687	121.7558	(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	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	146.8489	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	167.3868	185.3210	167.3868	172.9663	167.3868	172.9663	167.3868	167.3868	172.9663	167.3868	172.9663	167.3868	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	322.4845	325.8309	317.3981	299.4457	276.7841	255.4853	241.2565	237.9101	246.3429	264.2952	286.9569	308.2556	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	37.6849	(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)	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	-117.4791	(71)
Water heating gains (Table 5)	165.1278	162.3904	157.1175	145.5612	138.4826	131.0836	126.5394	130.2941	134.6963	142.9061	153.9842	163.6502	(72)
Total internal gains	725.0537	743.5969	711.9570	688.0279	652.7081	626.5900	602.2373	602.6456	621.0601	644.6428	683.9621	709.3473	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	9.3700	10.6334	0.6300	0.7000	0.7700	30.4497	(74)
East	8.7500	19.6403	0.6300	0.7000	0.7700	52.5203	(76)
South	0.3600	46.7521	0.6300	0.7000	0.7700	5.1437	(78)
West	7.6500	19.6403	0.6300	0.7000	0.7700	45.9177	(80)

Solar gains	134.0315	259.1807	426.7397	633.4685	793.4203	821.4562	778.1467	655.7184	498.9295	306.8503	166.4013	110.7797	(83)
Total gains	859.0851	1002.7777	1138.6967	1321.4963	1446.1284	1448.0461	1380.3839	1258.3640	1119.9895	951.4931	850.3634	820.1269	(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	43.8370	43.9201	44.0019	44.3900	44.4634	44.8082	44.8082	44.8726	44.6747	44.4634	44.3152	44.1613	
alpha	3.9225	3.9280	3.9335	3.9593	3.9642	3.9872	3.9872	3.9915	3.9783	3.9642	3.9543	3.9441	
util living area	0.9964	0.9929	0.9842	0.9547	0.8807	0.7374	0.5839	0.6484	0.8669	0.9738	0.9933	0.9970	(86)
MIT	19.0459	19.2542	19.6078	20.1100	20.5583	20.8546	20.9570	20.9349	20.6975	20.1127	19.4969	19.0155	(87)
Th 2	19.8279	19.8299	19.8318	19.8408	19.8424	19.8503	19.8503	19.8517	19.8472	19.8424	19.8390	19.8355	(88)
util rest of house	0.9953	0.9907	0.9792	0.9391	0.8378	0.6451	0.4489	0.5140	0.8016	0.9621	0.9909	0.9961	(89)
MIT 2	17.5562	17.8235	18.2748	18.9098	19.4440	19.7563	19.8341	19.8242	19.6144	18.9238	18.1408	17.5222	(90)
Living area fraction									fLA = Living area / (4) =			0.3844	(91)
MIT	18.1289	18.3735	18.7872	19.3712	19.8723	20.1785	20.2658	20.2512	20.0308	19.3808	18.6621	18.0963	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1289	18.3735	18.7872	19.3712	19.8723	20.1785	20.2658	20.2512	20.0308	19.3808	18.6621	18.0963	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9929	0.9869	0.9730	0.9311	0.8391	0.6739	0.5002	0.5642	0.8139	0.9557	0.9873	0.9941	(94)
Useful gains	853.0151	989.5978	1107.9319	1230.4688	1213.3971	975.8188	690.4978	709.9658	911.5908	909.3119	839.5830	815.2862	(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	2763.8224	2687.6997	2446.5046	2066.6887	1610.3020	1090.7505	716.7567	751.9262	1163.0926	1730.2031	2285.8576	2756.8946	(97)
Space heating kWh	1421.6407	1141.1244	995.8981	602.0783	295.2973	0.0000	0.0000	0.0000	0.0000	610.7431	1041.3177	1444.5566	(98a)
Space heating requirement - total per year (kWh/year)												7552.6562	
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	1421.6407	1141.1244	995.8981	602.0783	295.2973	0.0000	0.0000	0.0000	0.0000	610.7431	1041.3177	1444.5566	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7552.6562	
Space heating per m2											(98c) / (4) =	49.7507	(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	1421.6407	1141.1244	995.8981	602.0783	295.2973	0.0000	0.0000	0.0000	0.0000	610.7431	1041.3177	1444.5566	(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)	1540.2391	1236.3212	1078.9795	652.3059	319.9320	0.0000	0.0000	0.0000	0.0000	661.6935	1128.1882	1565.0668	(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	258.7048	228.7684	243.2629	214.7366	208.6661	188.6022	186.6924	193.8734	195.7136	217.5147	230.3499	256.0206	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2844	87.1584	86.8765	86.2429	84.8383	79.8000	79.8000	79.8000	79.8000	86.2455	87.0222	87.3174	(217)
Fuel for water heating, kWh/month	296.3929	262.4742	280.0100	248.9904	245.9575	236.3437	233.9503	242.9491	245.2552	252.2040	264.7024	293.2068	(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	34.7797	27.9015	25.1222	18.4056	14.2170	11.6154	12.9693	16.8579	21.8968	28.7298	32.4502	35.7463	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-105.7293	-133.8243	-172.8520	-173.9275	-171.8403	-154.9096	-152.7103	-151.2312	-147.3661	-141.9932	-110.5191	-93.2819	(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	-116.5504	-235.2327	-450.5392	-653.7452	-843.6691	-840.5590	-830.8497	-712.8380	-535.2604	-328.4169	-152.7736	-92.9708	(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	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	8182.7261	(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	3102.4365	(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)	280.6918	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-7503.5896	(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	4148.2648	(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	8182.7261	0.2100	1718.3725	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3102.4365	0.2100	651.5117	(264)
Space and water heating			2369.8842	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	280.6918	0.1443	40.5125	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1710.1847	0.1370	-234.3076	
PV Unit electricity exported	-5793.4049	0.1269	-735.4043	
Total			-969.7119	(269)
Total CO2, kg/year			1452.6140	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5700	(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	8182.7261	1.1300	9246.4805	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3102.4365	1.1300	3505.7533	(278)
Space and water heating			12752.2338	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	280.6918	1.5338	430.5344	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1710.1847	1.5065	-2576.3679	
PV Unit electricity exported	-5793.4049	0.4660	-2699.6966	
Total			-5276.0645	(283)
Total Primary energy kWh/year			8036.8045	(286)
Target Primary Energy Rate (TPER)			52.9400	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 4	Assessment Date	27/09/2024
Property Reference (cont.)	00001	Date of Test(s)	
Address	Plot 4 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

SAP Rating	82 B	DER	3.62	TER	8.86
Environment	96 A	% DER < TER			59.14
CO2 Emissions (tonnes/year)	0.54	DFEE	34.48	TFEE	41.16
General Requirements	See BREL	Target Fabric			16.23
Assessor's Name	19.02	DPER	37.76	TPER	46.63

Assessor Name	Mr. Neil Rothon	Accreditation	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	93.2800 (1b)	x	2.4000 (2b)	=	223.8720	(1b) - (3b)
First floor	78.6500 (1c)	x	2.6000 (2c)	=	204.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.9300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	428.3620	(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	5 * 10 =	50.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) =	0.1167	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2667	(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) =	0.2267	(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	0.2891	0.2834	0.2777	0.2494	0.2437	0.2154	0.2154	0.2097	0.2267	0.2437	0.2551	0.2664	(22b)
Effective ac	0.5418	0.5402	0.5386	0.5311	0.5297	0.5232	0.5232	0.5220	0.5257	0.5297	0.5325	0.5355	(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	
Front door			1.9500	1.2000	2.3400			(26)
side door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			27.1500	1.1450	31.0878			(27)
Heatloss Floor 1			93.2800	0.1000	9.3280	75.0000	6996.0000	(28a)
External Wall 1	194.9100	31.0500	163.8600	0.1500	24.5790	110.0000	18024.6000	(29a)
main	78.6500		78.6500	0.1200	9.4380	9.0000	707.8500	(30)
over gf	14.6300		14.6300	0.1200	1.7556	9.0000	131.6700	(30)
Total net area of external elements Aum(A, m2)			381.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		80.8684			(33)
Internal Wall 1			278.0000			9.0000	2502.0000	(32c)
Internal Floor 1			78.6500			18.0000	1415.7000	(32d)
Internal Ceiling 1			78.6500			9.0000	707.8500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		30485.6700	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							177.3144	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	41.5200	0.0590	2.4497
E16 Corner (normal)	24.8000	0.0350	0.8680

E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0660	-0.3168	
E12 Gable (insulation at ceiling level)	19.5400	0.0410	0.8011	
E10 Eaves (insulation at ceiling level)	32.8600	0.0640	2.1030	
E6 Intermediate floor within a dwelling	25.4100	0.0010	0.0254	
E24 Eaves (insulation at ceiling level - inverted)	10.8500	0.1500	1.6275	
E2 Other lintels (including other steel lintels)	23.7200	0.0310	0.7353	
E3 Sill	21.8600	0.0290	0.6339	
E4 Jamb	55.4000	0.0240	1.3296	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.2568 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 91.1252 (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	76.5855	76.3562	76.1314	75.0756	74.8780	73.9584	73.9584	73.7881	74.3127	74.8780	75.2776	75.6954	(38)
Heat transfer coeff	167.7107	167.4814	167.2566	166.2008	166.0032	165.0837	165.0837	164.9134	165.4379	166.0032	166.4029	166.8206	(39)
Average = Sum(39)m / 12 =												166.1998	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9755	0.9741	0.9728	0.9667	0.9655	0.9602	0.9602	0.9592	0.9622	0.9655	0.9679	0.9703	(40)
HLP (average)												0.9667	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9652 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.9357	72.8246	71.2055	68.1076	65.8215	63.2720	61.8228	63.4297	65.1911	67.9285	71.0929	73.6524	(42a)
Hot water usage for baths	31.9180	31.4440	30.7764	29.5456	28.6240	27.6021	27.0501	27.7130	28.4347	29.5282	30.7843	31.8101	(42b)
Hot water usage for other uses	44.9961	43.3599	41.7237	40.0874	38.4512	36.8150	36.8150	38.4512	40.0874	41.7237	43.3599	44.9961	(42c)
Average daily hot water use (litres/day)												138.6648	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8498	147.6284	143.7055	137.7407	132.8967	127.6890	125.6879	129.5939	133.7132	139.1803	145.2371	150.4586	(44)
Energy conte	238.9091	210.2209	220.8701	188.5601	178.9045	157.0086	152.0087	160.4643	164.8818	188.8664	206.9169	235.5818	(45)
Energy content (annual)										Total = Sum(45)m =		2303.1929	
Distribution loss (46)m = 0.15 x (45)m	35.8364	31.5331	33.1305	28.2840	26.8357	23.5513	22.8013	24.0696	24.7323	28.3300	31.0375	35.3373	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9720	(55)
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(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	292.3035	258.4481	274.2645	240.2321	232.2989	208.6806	205.4031	213.8587	216.5538	242.2608	258.5889	288.9762	(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	292.3035	258.4481	274.2645	240.2321	232.2989	208.6806	205.4031	213.8587	216.5538	242.2608	258.5889	288.9762	(64)
										Total per year (kWh/year) = Sum(64)m =		2931.8689	(64)
12Total per year (kWh/year)												2932	(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	122.1528	108.4802	116.1548	104.0338	102.2013	93.5430	93.2584	96.0699	96.1608	105.5136	110.1375	121.0465	(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	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	181.2340	200.6519	181.2340	187.2751	181.2340	187.2751	181.2340	181.2340	187.2751	181.2340	187.2751	181.2340	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.5129	347.0775	338.0949	318.9719	294.8325	272.1449	256.9882	253.4236	262.4063	281.5293	305.6686	328.3562	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	(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)	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	(71)
Water heating gains (Table 5)	164.1839	161.4289	156.1221	144.4914	137.3673	129.9208	125.3473	129.1262	133.5567	141.8193	152.9687	162.6969	(72)
Total internal gains	756.4080	776.6355	742.9281	718.2156	680.9110	656.8180	631.0468	631.2611	650.7153	672.0598	713.3897	739.7643	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	0.5600	10.6334	0.7200	0.7000	0.7700	2.0798	(74)
East	11.5400	19.6403	0.7200	0.7000	0.7700	79.1620	(76)
South	1.3800	46.7521	0.7200	0.7000	0.7700	22.5343	(78)
West	13.6700	19.6403	0.7200	0.7000	0.7700	93.7734	(80)

Solar gains	197.5495	379.1783	610.8939	876.5206	1065.7791	1088.3044	1037.1553	895.7815	705.1930	445.9566	244.9066	163.4192	(83)

Total gains	953.9575	1155.8138	1353.8221	1594.7363	1746.6901	1745.1225	1668.2020	1527.0426	1355.9083	1118.0165	958.2963	903.1835	(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	50.4931	50.5623	50.6302	50.9519	51.0125	51.2967	51.2967	51.3496	51.1868	51.0125	50.8900	50.7626	
alpha	4.3662	4.3708	4.3753	4.3968	4.4008	4.4198	4.4198	4.4233	4.4125	4.4008	4.3927	4.3842	
util living area	0.9940	0.9858	0.9640	0.8954	0.7613	0.5776	0.4291	0.4852	0.7391	0.9424	0.9877	0.9953	(86)
Living	19.4357	19.6847	20.0535	20.5066	20.8188	20.9588	20.9911	20.9850	20.8819	20.4305	19.8439	19.3904	
Non living	18.2579	18.5755	19.0412	19.5980	19.9502	20.0891	20.1128	20.1104	20.0245	19.5196	18.7839	18.2031	
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	20.1998	19.6847	20.0535	20.5066	20.8188	20.9588	20.9911	20.9850	20.8819	20.4305	19.8439	19.6156	(87)
Th 2	20.1038	20.1050	20.1060	20.1112	20.1122	20.1166	20.1166	20.1175	20.1149	20.1122	20.1102	20.1082	(88)
util rest of house	0.9926	0.9825	0.9555	0.8721	0.7141	0.5073	0.3459	0.3972	0.6725	0.9244	0.9843	0.9941	(89)
MIT 2	19.3679	18.5755	19.0412	19.5980	19.9502	20.0891	20.1128	20.1104	20.0245	19.5196	18.7839	18.5464	(90)
Living area fraction										fLA = Living area / (4) =		0.1302	(91)
MIT	19.4762	18.7199	19.1730	19.7163	20.0633	20.2023	20.2271	20.2242	20.1361	19.6381	18.9219	18.6856	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4762	18.7199	19.1730	19.7163	20.0633	20.2023	20.2271	20.2242	20.1361	19.6381	18.9219	18.6856	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9913	0.9753	0.9442	0.8600	0.7113	0.5144	0.3564	0.4081	0.6743	0.9122	0.9778	0.9916	(94)
Useful gains	945.6984	1127.3173	1278.2396	1371.4237	1242.4250	897.7134	594.6133	623.1979	914.2436	1019.9076	936.9887	895.5827	(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	2545.2122	2314.5809	2119.6376	1797.6716	1388.3304	924.8507	598.7735	630.6670	998.5967	1500.3602	1967.1996	2416.4924	(97)
Space heating kWh	1190.0383	797.8411	626.0001	306.8985	108.5536	0.0000	0.0000	0.0000	0.0000	357.4567	741.7518	1131.5568	(98a)
Space heating requirement - total per year (kWh/year)												5260.0969	
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	1190.0383	797.8411	626.0001	306.8985	108.5536	0.0000	0.0000	0.0000	0.0000	357.4567	741.7518	1131.5568	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5260.0969	
Space heating per m2											(98c) / (4) =	30.5944	(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 %)												249.6161	(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	1190.0383	797.8411	626.0001	306.8985	108.5536	0.0000	0.0000	0.0000	0.0000	357.4567	741.7518	1131.5568	(98)
Space heating efficiency (main heating system 1)	249.6161	249.6161	249.6161	249.6161	249.6161	0.0000	0.0000	0.0000	0.0000	249.6161	249.6161	249.6161	(210)
Space heating fuel (main heating system)	476.7475	319.6273	250.7852	122.9482	43.4882	0.0000	0.0000	0.0000	0.0000	143.2026	297.1571	453.3189	(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	292.3035	258.4481	274.2645	240.2321	232.2989	208.6806	205.4031	213.8587	216.5538	242.2608	258.5889	288.9762	(64)
Efficiency of water heater												171.5721	(216)
(217)m	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	(217)
Fuel for water heating, kWh/month	170.3678	150.6353	159.8538	140.0182	135.3943	121.6285	119.7182	124.6465	126.2174	141.2006	150.7173	168.4284	(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	45.9061	36.8276	33.1591	24.2938	18.7652	15.3314	17.1183	22.2510	28.9018	37.9207	42.8314	47.1819	(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												2107.2749	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												171.5721	
Water heating fuel used												1708.8262	(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)	370.4883	(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	4186.5894	(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	2107.2749	0.1560	328.7796	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1708.8262	0.1410	240.8824	(264)
Space and water heating			569.6620	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	370.4883	0.1443	53.4729	(268)
Total CO2, kg/year			623.1349	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6200	(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	2107.2749	1.5776	3324.3955	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1708.8262	1.5212	2599.5273	(278)
Space and water heating			5923.9229	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	370.4883	1.5338	568.2673	(282)
Total Primary energy kWh/year			6492.1902	(286)
Dwelling Primary energy Rate (DPER)			37.7600	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	93.2800 (1b)	x	2.4000 (2b)	=	223.8720	(1b) - (3b)
First floor	78.6500 (1c)	x	2.6000 (2c)	=	204.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.9300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	428.3620	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0934	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3434	(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) =	0.2919	(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	0.3721	0.3648	0.3575	0.3211	0.3138	0.2773	0.2773	0.2700	0.2919	0.3138	0.3284	0.3429	(22b)
Effective ac	0.5692	0.5666	0.5639	0.5515	0.5492	0.5384	0.5384	0.5364	0.5426	0.5492	0.5539	0.5588	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			3.9000	1.0000	3.9000			(26)
TER Opening Type (Uw = 1.20)			27.1500	1.1450	31.0878			(27)
Heatloss Floor 1			93.2800	0.1300	12.1264			(28a)
External Wall 1	194.9100	31.0500	163.8600	0.1800	29.4948			(29a)
main	78.6500		78.6500	0.1100	8.6515			(30)
over gf	14.6300		14.6300	0.1100	1.6093			(30)
Total net area of external elements Aum(A, m2)			381.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		86.8698			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 177.3144 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	41.5200	0.1600	6.6432
E16 Corner (normal)	24.8000	0.0900	2.2320
E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0900	-0.4320
E12 Gable (insulation at ceiling level)	19.5400	0.0600	1.1724
E10 Eaves (insulation at ceiling level)	32.8600	0.0600	1.9716
E6 Intermediate floor within a dwelling	25.4100	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	10.8500	0.2400	2.6040
E2 Other lintels (including other steel lintels)	23.7200	0.0500	1.1860
E3 Sill	21.8600	0.0500	1.0930
E4 Jamb	55.4000	0.0500	2.7700

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.2402 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 106.1100 (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	80.4679	80.0878	79.7152	77.9653	77.6379	76.1138	76.1138	75.8316	76.7009	77.6379	78.3003	78.9927	(38)
Heat transfer coeff	186.5779	186.1978	185.8252	184.0753	183.7479	182.2238	182.2238	181.9416	182.8109	183.7479	184.4102	185.1027	(39)
Average = Sum(39)m / 12 =												184.0738	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0852	1.0830	1.0808	1.0706	1.0687	1.0599	1.0599	1.0582	1.0633	1.0687	1.0726	1.0766	(40)
HLP (average)												1.0706	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9652 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.9357	72.8246	71.2055	68.1076	65.8215	63.2720	61.8228	63.4297	65.1911	67.9285	71.0929	73.6524	(42a)
Hot water usage for baths	31.9180	31.4440	30.7764	29.5456	28.6240	27.6021	27.0501	27.7130	28.4347	29.5282	30.7843	31.8101	(42b)
Hot water usage for other uses	44.9961	43.3599	41.7237	40.0874	38.4512	36.8150	36.8150	38.4512	40.0874	41.7237	43.3599	44.9961	(42c)
Average daily hot water use (litres/day)												138.6648	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8498	147.6284	143.7055	137.7407	132.8967	127.6890	125.6879	129.5939	133.7132	139.1803	145.2371	150.4586	(44)
Energy conte	238.9091	210.2209	220.8701	188.5601	178.9045	157.0086	152.0087	160.4643	164.8818	188.8664	206.9169	235.5818	(45)
Energy content (annual)										Total = Sum(45)m =		2303.1929	
Distribution loss (46)m = 0.15 x (45)m	35.8364	31.5331	33.1305	28.2840	26.8357	23.5513	22.8013	24.0696	24.7323	28.3300	31.0375	35.3373	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0208	(55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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	293.8159	259.8141	275.7769	241.6957	233.8113	210.1442	206.9154	215.3711	218.0174	243.7732	260.0525	290.4886	(62)
WWHRS	-33.8003	-29.8933	-31.3025	-25.9197	-24.1562	-20.6707	-19.3755	-20.6039	-21.3867	-25.2125	-28.5627	-33.1744	(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	260.0156	229.9208	244.4744	215.7760	209.6550	189.4735	187.5400	194.7672	196.6307	218.5606	231.4897	257.3142	(64)
									Total per year (kWh/year) = Sum(64)m =			2635.6178	(64)
12Total per year (kWh/year)												2636	(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	123.3627	109.5730	117.3647	105.2047	103.4112	94.7138	94.4683	97.2798	97.3317	106.7235	111.3083	122.2564	(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	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	181.2340	200.6519	181.2340	187.2751	181.2340	187.2751	181.2340	181.2340	187.2751	181.2340	187.2751	181.2340	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.5129	347.0775	338.0949	318.9719	294.8325	272.1449	256.9882	253.4236	262.4063	281.5293	305.6686	328.3562	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	(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)	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	(71)
Water heating gains (Table 5)	165.8101	163.0551	157.7483	146.1177	138.9935	131.5470	126.9735	130.7524	135.1829	143.4456	154.5949	164.3231	(72)
Total internal gains	761.0343	781.2618	747.5544	722.8419	685.5372	658.4443	632.6730	632.8873	652.3415	676.6861	718.0159	744.3905	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	0.5600	10.6334	0.6300	0.7000	0.7700	1.8198	(74)
East	11.5400	19.6403	0.6300	0.7000	0.7700	69.2668	(76)
South	1.3800	46.7521	0.6300	0.7000	0.7700	19.7175	(78)
West	13.6700	19.6403	0.6300	0.7000	0.7700	82.0517	(80)

Solar gains	172.8558	331.7810	534.5322	766.9555	932.5567	952.2664	907.5109	783.8089	617.0439	390.2121	214.2933	142.9918 (83)
Total gains	933.8901	1113.0428	1282.0865	1489.7974	1618.0939	1610.7106	1540.1838	1416.6961	1269.3854	1066.8981	932.3092	887.3823 (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	45.3872	45.4798	45.5710	46.0042	46.0862	46.4717	46.4717	46.5437	46.3224	46.0862	45.9207	45.7489	
alpha	4.0258	4.0320	4.0381	4.0669	4.0724	4.0981	4.0981	4.1029	4.0882	4.0724	4.0614	4.0499	
util living area													
	0.9945	0.9883	0.9732	0.9258	0.8241	0.6581	0.5027	0.5608	0.8009	0.9566	0.9895	0.9955	(86)
MIT	19.2019	19.4389	19.8093	20.3003	20.6902	20.9122	20.9773	20.9649	20.7977	20.2651	19.6469	19.1658	(87)
Th 2	20.0129	20.0148	20.0165	20.0249	20.0264	20.0337	20.0337	20.0351	20.0309	20.0264	20.0233	20.0200	(88)
util rest of house													
	0.9932	0.9855	0.9665	0.9067	0.7798	0.5795	0.4002	0.4557	0.7356	0.9416	0.9864	0.9944	(89)
MIT 2	17.8985	18.2019	18.6725	19.2869	19.7423	19.9736	20.0238	20.0183	19.8713	19.2559	18.4746	17.8571	(90)
Living area fraction										fLA = Living area / (4) =		0.1302	(91)
MIT	18.0682	18.3629	18.8205	19.4188	19.8657	20.0958	20.1479	20.1415	19.9919	19.3873	18.6272	18.0275	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0682	18.3629	18.8205	19.4188	19.8657	20.0958	20.1479	20.1415	19.9919	19.3873	18.6272	18.0275	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9891	0.9786	0.9553	0.8920	0.7714	0.5849	0.4127	0.4679	0.7326	0.9285	0.9799	0.9910	(94)
Useful gains	923.7124	1089.2058	1224.7311	1328.8511	1248.2621	942.1710	635.6897	662.8299	929.9420	990.6199	913.6095	879.3998	(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													
	2568.8410	2506.7704	2289.4597	1936.2522	1500.4311	1001.4571	646.5152	680.7382	1077.1077	1614.6449	2125.7289	2559.5073	(97)
Space heating kWh													
	1223.9757	952.6034	792.1581	437.3288	187.6137	0.0000	0.0000	0.0000	0.0000	464.2746	872.7260	1250.0000	(98a)
Space heating requirement - total per year (kWh/year)												6180.6803	
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													
	1223.9757	952.6034	792.1581	437.3288	187.6137	0.0000	0.0000	0.0000	0.0000	464.2746	872.7260	1250.0000	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6180.6803	
Space heating per m2											(98c) / (4) =	35.9488	(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													
	1223.9757	952.6034	792.1581	437.3288	187.6137	0.0000	0.0000	0.0000	0.0000	464.2746	872.7260	1250.0000	(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)													
	1326.0842	1032.0730	858.2428	473.8123	203.2651	0.0000	0.0000	0.0000	0.0000	503.0061	945.5319	1354.2796	(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													
	260.0156	229.9208	244.4744	215.7760	209.6550	189.4735	187.5400	194.7672	196.6307	218.5606	231.4897	257.3142	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.0792	86.8945	86.4993	85.6100	83.8116	79.8000	79.8000	79.8000	79.8000	85.7061	86.7489	87.1226	(217)
Fuel for water heating, kWh/month													
	298.5966	264.5976	282.6316	252.0452	250.1505	237.4355	235.0125	244.0692	246.4044	255.0118	266.8503	295.3472	(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	37.6568	30.2097	27.2005	19.9283	15.3932	12.5763	14.0422	18.2525	23.7082	31.1065	35.1347	38.7034	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-77.8912	-105.3372	-145.2446	-156.3343	-162.7787	-149.7227	-147.6626	-142.0500	-131.5632	-116.8531	-83.9355	-67.8602	(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	-58.6891	-121.4307	-237.7995	-352.2310	-461.2033	-461.9452	-456.6881	-388.8793	-287.8782	-172.1914	-77.8453	-46.5832	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	6696.2950	(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	3128.1522	(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)	303.9123	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4610.5977	(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	5603.7618	(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	6696.2950	0.2100	1406.2219	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3128.1522	0.2100	656.9120	(264)
Space and water heating			2063.1339	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	303.9123	0.1443	43.8639	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1487.2333	0.1355	-201.5603	
PV Unit electricity exported	-3123.3644	0.1263	-394.4854	
Total			-596.0457	(269)
Total CO2, kg/year			1522.8814	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.8600	(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	6696.2950	1.1300	7566.8133	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3128.1522	1.1300	3534.8120	(278)
Space and water heating			11101.6254	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	303.9123	1.5338	466.1508	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1487.2333	1.5009	-2232.2435	
PV Unit electricity exported	-3123.3644	0.4636	-1448.0872	
Total			-3680.3307	(283)
Total Primary energy kWh/year			8017.5462	(286)
Target Primary Energy Rate (TPER)			46.6300	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 5	Assessment Date	27/09/2024
Property Reference (cont.)	00001	Date of Test(s)	
Address	Plot 5 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

SAP Rating	81 B	DER	3.86	TER	9.66
Environment	96 A	% DER < TER			60.04
CO2 Emissions (Tonnes/annum)	0.58	DFEE	37.89	TFEE	44.51
General Requirements	See BREL	Target Fabric			14.86
Assessor's Name	21.13	DPER	40.18	TPER	50.94

Assessor Name	Mr. Neil Rothon	Accreditation	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	93.2800 (1b)	x	2.4000 (2b)	=	223.8720	(1b) - (3b)
First floor	78.6500 (1c)	x	2.6000 (2c)	=	204.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.9300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	428.3620	(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	5 * 10 =	50.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) =	0.1167	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2667	(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) =	0.2267	(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	0.2891	0.2834	0.2777	0.2494	0.2437	0.2154	0.2154	0.2097	0.2267	0.2437	0.2551	0.2664	(22b)
Effective ac	0.5418	0.5402	0.5386	0.5311	0.5297	0.5232	0.5232	0.5220	0.5257	0.5297	0.5325	0.5355	(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	
Front door			1.9500	1.2000	2.3400			(26)
side door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			27.1500	1.1450	31.0878			(27)
Heatloss Floor 1			93.2800	0.1000	9.3280	75.0000	6996.0000	(28a)
External Wall 1	194.9100	31.0500	163.8600	0.1500	24.5790	110.0000	18024.6000	(29a)
main	78.6500		78.6500	0.1200	9.4380	9.0000	707.8500	(30)
over gf	14.6300		14.6300	0.1200	1.7556	9.0000	131.6700	(30)
Total net area of external elements Aum(A, m2)			381.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		80.8684			(33)
Internal Wall 1			278.0000			9.0000	2502.0000	(32c)
Internal Floor 1			78.6500			18.0000	1415.7000	(32d)
Internal Ceiling 1			78.6500			9.0000	707.8500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		30485.6700	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							177.3144	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	41.5200	0.0590	2.4497
E16 Corner (normal)	24.8000	0.0350	0.8680

E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0660	-0.3168	
E12 Gable (insulation at ceiling level)	19.5400	0.0410	0.8011	
E10 Eaves (insulation at ceiling level)	32.8600	0.0640	2.1030	
E6 Intermediate floor within a dwelling	25.4100	0.0010	0.0254	
E24 Eaves (insulation at ceiling level - inverted)	10.8500	0.1500	1.6275	
E2 Other lintels (including other steel lintels)	23.7200	0.0310	0.7353	
E3 Sill	21.8600	0.0290	0.6339	
E4 Jamb	55.4000	0.0240	1.3296	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.2568 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 91.1252 (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	76.5855	76.3562	76.1314	75.0756	74.8780	73.9584	73.9584	73.7881	74.3127	74.8780	75.2776	75.6954	(38)
Heat transfer coeff	167.7107	167.4814	167.2566	166.2008	166.0032	165.0837	165.0837	164.9134	165.4379	166.0032	166.4029	166.8206	(39)
Average = Sum(39)m / 12 =												166.1998	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9755	0.9741	0.9728	0.9667	0.9655	0.9602	0.9602	0.9592	0.9622	0.9655	0.9679	0.9703	(40)
HLP (average)												0.9667	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9652 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.9357	72.8246	71.2055	68.1076	65.8215	63.2720	61.8228	63.4297	65.1911	67.9285	71.0929	73.6524	(42a)
Hot water usage for baths	31.9180	31.4440	30.7764	29.5456	28.6240	27.6021	27.0501	27.7130	28.4347	29.5282	30.7843	31.8101	(42b)
Hot water usage for other uses	44.9961	43.3599	41.7237	40.0874	38.4512	36.8150	36.8150	38.4512	40.0874	41.7237	43.3599	44.9961	(42c)
Average daily hot water use (litres/day)												138.6648	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8498	147.6284	143.7055	137.7407	132.8967	127.6890	125.6879	129.5939	133.7132	139.1803	145.2371	150.4586	(44)
Energy conte	238.9091	210.2209	220.8701	188.5601	178.9045	157.0086	152.0087	160.4643	164.8818	188.8664	206.9169	235.5818	(45)
Energy content (annual)										Total = Sum(45)m =		2303.1929	
Distribution loss (46)m = 0.15 x (45)m	35.8364	31.5331	33.1305	28.2840	26.8357	23.5513	22.8013	24.0696	24.7323	28.3300	31.0375	35.3373	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9720	(55)
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(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	292.3035	258.4481	274.2645	240.2321	232.2989	208.6806	205.4031	213.8587	216.5538	242.2608	258.5889	288.9762	(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	292.3035	258.4481	274.2645	240.2321	232.2989	208.6806	205.4031	213.8587	216.5538	242.2608	258.5889	288.9762	(64)
										Total per year (kWh/year) = Sum(64)m =		2931.8689	(64)
12Total per year (kWh/year)												2932	(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	122.1528	108.4802	116.1548	104.0338	102.2013	93.5430	93.2584	96.0699	96.1608	105.5136	110.1375	121.0465	(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	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	181.2340	200.6519	181.2340	187.2751	181.2340	187.2751	181.2340	181.2340	187.2751	181.2340	187.2751	181.2340	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.5129	347.0775	338.0949	318.9719	294.8325	272.1449	256.9882	253.4236	262.4063	281.5293	305.6686	328.3562	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	(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)	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	(71)
Water heating gains (Table 5)	164.1839	161.4289	156.1221	144.4914	137.3673	129.9208	125.3473	129.1262	133.5567	141.8193	152.9687	162.6969	(72)
Total internal gains	756.4080	776.6355	742.9281	718.2156	680.9110	656.8180	631.0468	631.2611	650.7153	672.0598	713.3897	739.7643	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	25.2100	10.6334	0.7200	0.7000	0.7700	93.6286	(74)
East	1.3800	19.6403	0.7200	0.7000	0.7700	9.4665	(76)
West	0.5600	19.6403	0.7200	0.7000	0.7700	3.8415	(80)

Solar gains	106.9366	204.9623	346.9172	550.9007	734.5131	782.7278	732.2209	585.8240	415.4227	243.8823	132.0964	88.9973	(83)
Total gains	863.3446	981.5978	1089.8454	1269.1163	1415.4241	1439.5459	1363.2676	1217.0850	1066.1380	915.9421	845.4861	828.7616	(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	50.4931	50.5623	50.6302	50.9519	51.0125	51.2967	51.2967	51.3496	51.1868	51.0125	50.8900	50.7626	
alpha	4.3662	4.3708	4.3753	4.3968	4.4008	4.4198	4.4198	4.4233	4.4125	4.4008	4.3927	4.3842	
util living area	0.9959	0.9923	0.9831	0.9468	0.8484	0.6727	0.5169	0.5919	0.8420	0.9702	0.9923	0.9966	(86)
Living	19.3610	19.5451	19.8561	20.3150	20.7097	20.9253	20.9816	20.9676	20.7934	20.2908	19.7530	19.3288	
Non living	18.1627	18.3985	18.7952	19.3731	19.8396	20.0642	20.1082	20.1011	19.9442	19.3517	18.6688	18.1243	
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	20.1616	19.5451	19.8561	20.3150	20.7097	20.9253	20.9816	20.9676	20.7934	20.2908	19.7530	19.5625	(87)
Th 2	20.1038	20.1050	20.1060	20.1112	20.1122	20.1166	20.1166	20.1175	20.1149	20.1122	20.1102	20.1082	(88)
util rest of house	0.9950	0.9904	0.9788	0.9326	0.8093	0.5991	0.4202	0.4914	0.7861	0.9597	0.9901	0.9958	(89)
MIT 2	19.3300	18.3985	18.7952	19.3731	19.8396	20.0642	20.1082	20.1011	19.9442	19.3517	18.6688	18.4818	(90)
Living area fraction										fLA = Living area / (4) =		0.1302	(91)
MIT	19.4382	18.5477	18.9333	19.4957	19.9528	20.1763	20.2219	20.2139	20.0548	19.4740	18.8099	18.6225	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4382	18.5477	18.9333	19.4957	19.9528	20.1763	20.2219	20.2139	20.0548	19.4740	18.8099	18.6225	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9940	0.9857	0.9709	0.9202	0.8013	0.6044	0.4321	0.5029	0.7817	0.9494	0.9854	0.9939	(94)
Useful gains	858.1962	967.5246	1058.1613	1167.8618	1134.1979	870.0754	589.0292	612.1051	833.3646	869.5821	833.1260	823.6663	(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	2538.8399	2285.7431	2079.5552	1761.0087	1369.9984	920.5494	597.9198	628.9674	985.1421	1473.1092	1948.5624	2405.9713	(97)
Space heating kWh	1250.3989	885.8428	759.9170	427.0657	175.4356	0.0000	0.0000	0.0000	0.0000	449.0241	803.1142	1177.2349	(98a)
Space heating requirement - total per year (kWh/year)												5928.0334	
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	1250.3989	885.8428	759.9170	427.0657	175.4356	0.0000	0.0000	0.0000	0.0000	449.0241	803.1142	1177.2349	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5928.0334	
Space heating per m2											(98c) / (4) =	34.4793	(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 %) 249.6161 (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	1250.3989	885.8428	759.9170	427.0657	175.4356	0.0000	0.0000	0.0000	0.0000	449.0241	803.1142	1177.2349	(98)
Space heating efficiency (main heating system 1)	249.6161	249.6161	249.6161	249.6161	249.6161	0.0000	0.0000	0.0000	0.0000	249.6161	249.6161	249.6161	(210)
Space heating fuel (main heating system)	500.9288	354.8821	304.4343	171.0890	70.2822	0.0000	0.0000	0.0000	0.0000	179.8859	321.7398	471.6182	(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	292.3035	258.4481	274.2645	240.2321	232.2989	208.6806	205.4031	213.8587	216.5538	242.2608	258.5889	288.9762	(64)
Efficiency of water heater												171.5721	(216)
(217)m	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	(217)
Fuel for water heating, kWh/month	170.3678	150.6353	159.8538	140.0182	135.3943	121.6285	119.7182	124.6465	126.2174	141.2006	150.7173	168.4284	(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	45.9061	36.8276	33.1591	24.2938	18.7652	15.3314	17.1183	22.2510	28.9018	37.9207	42.8314	47.1819	(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												2374.8604	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												171.5721	
Water heating fuel used												1708.8262	(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)	370.4883	(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	4454.1749	(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	2374.8604	0.1552	368.6749	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1708.8262	0.1410	240.8824	(264)
Space and water heating			609.5573	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	370.4883	0.1443	53.4729	(268)
Total CO2, kg/year			663.0302	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8600	(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	2374.8604	1.5747	3739.7387	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1708.8262	1.5212	2599.5273	(278)
Space and water heating			6339.2660	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	370.4883	1.5338	568.2673	(282)
Total Primary energy kWh/year			6907.5333	(286)
Dwelling Primary energy Rate (DPER)			40.1800	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		93.2800 (1b)	x	2.4000 (2b)	=	223.8720	(1b) - (3b)
First floor		78.6500 (1c)	x	2.6000 (2c)	=	204.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.9300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	428.3620	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0934	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3434	(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) =	0.2919	(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	0.3721	0.3648	0.3575	0.3211	0.3138	0.2773	0.2773	0.2700	0.2919	0.3138	0.3284	0.3429	(22b)
Effective ac	0.5692	0.5666	0.5639	0.5515	0.5492	0.5384	0.5384	0.5364	0.5426	0.5492	0.5539	0.5588	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			3.9000	1.0000	3.9000			(26)
TER Opening Type (Uw = 1.20)			27.1500	1.1450	31.0878			(27)
Heatloss Floor 1			93.2800	0.1300	12.1264			(28a)
External Wall 1	194.9100	31.0500	163.8600	0.1800	29.4948			(29a)
main	78.6500		78.6500	0.1100	8.6515			(30)
over gf	14.6300		14.6300	0.1100	1.6093			(30)
Total net area of external elements Aum(A, m2)			381.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		86.8698			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 177.3144 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	41.5200	0.1600	6.6432
E16 Corner (normal)	24.8000	0.0900	2.2320
E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0900	-0.4320
E12 Gable (insulation at ceiling level)	19.5400	0.0600	1.1724
E10 Eaves (insulation at ceiling level)	32.8600	0.0600	1.9716
E6 Intermediate floor within a dwelling	25.4100	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	10.8500	0.2400	2.6040
E2 Other lintels (including other steel lintels)	23.7200	0.0500	1.1860
E3 Sill	21.8600	0.0500	1.0930
E4 Jamb	55.4000	0.0500	2.7700

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.2402 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 106.1100 (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	80.4679	80.0878	79.7152	77.9653	77.6379	76.1138	76.1138	75.8316	76.7009	77.6379	78.3003	78.9927	(38)
Heat transfer coeff	186.5779	186.1978	185.8252	184.0753	183.7479	182.2238	182.2238	181.9416	182.8109	183.7479	184.4102	185.1027	(39)
Average = Sum(39)m / 12 =												184.0738	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0852	1.0830	1.0808	1.0706	1.0687	1.0599	1.0599	1.0582	1.0633	1.0687	1.0726	1.0766	(40)
HLP (average)												1.0706	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9652 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.9357	72.8246	71.2055	68.1076	65.8215	63.2720	61.8228	63.4297	65.1911	67.9285	71.0929	73.6524	(42a)
Hot water usage for baths	31.9180	31.4440	30.7764	29.5456	28.6240	27.6021	27.0501	27.7130	28.4347	29.5282	30.7843	31.8101	(42b)
Hot water usage for other uses	44.9961	43.3599	41.7237	40.0874	38.4512	36.8150	36.8150	38.4512	40.0874	41.7237	43.3599	44.9961	(42c)
Average daily hot water use (litres/day)												138.6648	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8498	147.6284	143.7055	137.7407	132.8967	127.6890	125.6879	129.5939	133.7132	139.1803	145.2371	150.4586	(44)
Energy conte	238.9091	210.2209	220.8701	188.5601	178.9045	157.0086	152.0087	160.4643	164.8818	188.8664	206.9169	235.5818	(45)
Energy content (annual)										Total = Sum(45)m =		2303.1929	
Distribution loss (46)m = 0.15 x (45)m	35.8364	31.5331	33.1305	28.2840	26.8357	23.5513	22.8013	24.0696	24.7323	28.3300	31.0375	35.3373	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0208	(55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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	293.8159	259.8141	275.7769	241.6957	233.8113	210.1442	206.9154	215.3711	218.0174	243.7732	260.0525	290.4886	(62)
WWHRS	-33.8003	-29.8933	-31.3025	-25.9197	-24.1562	-20.6707	-19.3755	-20.6039	-21.3867	-25.2125	-28.5627	-33.1744	(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	260.0156	229.9208	244.4744	215.7760	209.6550	189.4735	187.5400	194.7672	196.6307	218.5606	231.4897	257.3142	(64)
										Total per year (kWh/year) = Sum(64)m =		2635.6178	(64)
12Total per year (kWh/year)												2636	(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	123.3627	109.5730	117.3647	105.2047	103.4112	94.7138	94.4683	97.2798	97.3317	106.7235	111.3083	122.2564	(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	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	181.2340	200.6519	181.2340	187.2751	181.2340	187.2751	181.2340	181.2340	187.2751	181.2340	187.2751	181.2340	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.5129	347.0775	338.0949	318.9719	294.8325	272.1449	256.9882	253.4236	262.4063	281.5293	305.6686	328.3562	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	(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)	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	(71)
Water heating gains (Table 5)	165.8101	163.0551	157.7483	146.1177	138.9935	131.5470	126.9735	130.7524	135.1829	143.4456	154.5949	164.3231	(72)
Total internal gains	761.0343	781.2618	747.5544	722.8419	685.5372	658.4443	632.6730	632.8873	652.3415	676.6861	718.0159	744.3905	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	25.2100	10.6334	0.6300	0.7000	0.7700	81.9250	(74)
East	1.3800	19.6403	0.6300	0.7000	0.7700	8.2832	(76)
West	0.5600	19.6403	0.6300	0.7000	0.7700	3.3613	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	93.5695	179.3420	303.5526	482.0381	642.6990	684.8869	640.6932	512.5960	363.4949	213.3970	115.5844	77.8726	(83)
Total gains	854.6038	960.6038	1051.1069	1204.8800	1328.2362	1343.3311	1273.3662	1145.4832	1015.8364	890.0831	833.6003	822.2631	(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	45.3872	45.4798	45.5710	46.0042	46.0862	46.4717	46.4717	46.5437	46.3224	46.0862	45.9207	45.7489	
alpha	4.0258	4.0320	4.0381	4.0669	4.0724	4.0981	4.0981	4.1029	4.0882	4.0724	4.0614	4.0499	
util living area	0.9960	0.9931	0.9863	0.9605	0.8894	0.7433	0.5910	0.6626	0.8797	0.9757	0.9929	0.9966	(86)
MIT	19.1381	19.3187	19.6356	20.1172	20.5645	20.8613	20.9592	20.9355	20.6960	20.1395	19.5687	19.1132	(87)
Th 2	20.0129	20.0148	20.0165	20.0249	20.0264	20.0337	20.0337	20.0351	20.0309	20.0264	20.0233	20.0200	(88)
util rest of house	0.9950	0.9913	0.9825	0.9489	0.8552	0.6667	0.4774	0.5501	0.8287	0.9666	0.9908	0.9958	(89)
MIT 2	17.8172	18.0492	18.4546	19.0673	19.6090	19.9334	20.0149	20.0019	19.7739	19.1031	18.3754	17.7899	(90)
Living area fraction									fLA = Living area / (4) =			0.1302	(91)
MIT	17.9891	18.2145	18.6083	19.2040	19.7334	20.0542	20.1378	20.1234	19.8939	19.2380	18.5308	17.9621	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9891	18.2145	18.6083	19.2040	19.7334	20.0542	20.1378	20.1234	19.8939	19.2380	18.5308	17.9621	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9919	0.9865	0.9748	0.9360	0.8428	0.6685	0.4904	0.5613	0.8199	0.9560	0.9859	0.9930	(94)
Useful gains	847.6460	947.6268	1024.6225	1127.7096	1119.4353	898.0361	624.4830	643.0069	832.8671	850.9237	821.8504	816.5310	(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	2554.0835	2479.1292	2250.0304	1896.7064	1476.1218	993.8801	644.6707	677.4478	1059.1879	1587.2120	2107.9488	2547.4042	(97)
Space heating kWh	1269.5895	1029.1696	911.7034	553.6777	265.3748	0.0000	0.0000	0.0000	0.0000	547.7985	925.9908	1287.7696	(98a)
Space heating requirement - total per year (kWh/year)												6791.0739	
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	1269.5895	1029.1696	911.7034	553.6777	265.3748	0.0000	0.0000	0.0000	0.0000	547.7985	925.9908	1287.7696	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6791.0739	
Space heating per m2										(98c) / (4) =		39.4991	(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	1269.5895	1029.1696	911.7034	553.6777	265.3748	0.0000	0.0000	0.0000	0.0000	547.7985	925.9908	1287.7696	(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)	1375.5032	1115.0267	987.7610	599.8675	287.5133	0.0000	0.0000	0.0000	0.0000	593.4978	1003.2403	1395.2000	(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	260.0156	229.9208	244.4744	215.7760	209.6550	189.4735	187.5400	194.7672	196.6307	218.5606	231.4897	257.3142	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.1296	87.0081	86.7316	86.0776	84.5894	79.8000	79.8000	79.8000	79.8000	86.0328	86.8412	87.1629	(217)
Fuel for water heating, kWh/month	298.4241	264.2523	281.8745	250.6761	247.8501	237.4355	235.0125	244.0692	246.4044	254.0434	266.5666	295.2108	(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	37.6568	30.2097	27.2005	19.9283	15.3932	12.5763	14.0422	18.2525	23.7082	31.1065	35.1347	38.7034	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-77.8912	-105.3372	-145.2446	-156.3343	-162.7787	-149.7227	-147.6626	-142.0500	-131.5632	-116.8531	-83.9355	-67.8602	(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	-58.6891	-121.4307	-237.7995	-352.2310	-461.2033	-461.9452	-456.6881	-388.8793	-287.8782	-172.1914	-77.8453	-46.5832	(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	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	7357.6099	(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	3121.8195	(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)	303.9123	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4610.5977	(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	6258.7439	(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	7357.6099	0.2100	1545.0981	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3121.8195	0.2100	655.5821	(264)
Space and water heating			2200.6802	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	303.9123	0.1443	43.8639	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1487.2333	0.1355	-201.5603	
PV Unit electricity exported	-3123.3644	0.1263	-394.4854	
Total			-596.0457	(269)
Total CO2, kg/year			1660.4276	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6600	(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	7357.6099	1.1300	8314.0992	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3121.8195	1.1300	3527.6560	(278)
Space and water heating			11841.7552	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	303.9123	1.5338	466.1508	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1487.2333	1.5009	-2232.2435	
PV Unit electricity exported	-3123.3644	0.4636	-1448.0872	
Total			-3680.3307	(283)
Total Primary energy kWh/year			8757.6760	(286)
Target Primary Energy Rate (TPER)			50.9400	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 6	Assessment Date	27/09/2024
Property Reference 2	00001	Date of Test	
Address	Plot 7 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

EPC Rating	82 B	DER	3.47	TER	8.55
Environmental	96 A	% DER < TER			59.42
CO2 Emissions (tonnes)	0.58	DFEE	34.11	TFEE	40.81
Compliance Check	See BREL	% DFEE < TFEE			16.42
Target Fabric	20.08	DPER	36.11	TPER	45.18

Assessor Details	Mr. Neil Rothon	Assessor ID	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	103.8800	(1b)	x 2.4000	(2b) =	249.3120	(1b) - (3b)
First floor	88.3200	(1c)	x 2.6000	(2c) =	229.6320	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	192.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		478.9440	(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	5 * 10 =	50.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) =	0.1044	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2544	(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) =	0.2162	(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	0.2757	0.2703	0.2649	0.2379	0.2325	0.2054	0.2054	0.2000	0.2162	0.2325	0.2433	0.2541	(22b)
Effective ac	0.5380	0.5365	0.5351	0.5283	0.5270	0.5211	0.5211	0.5200	0.5234	0.5270	0.5296	0.5323	(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	
Front door			1.9500	1.2000	2.3400			(26)
side door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			26.1100	1.1450	29.8969			(27)
to garage			1.9500	1.4000	2.7300			(26)
Heatloss Floor 1			103.8800	0.1000	10.3880	75.0000	7791.0000	(28a)
External Wall 1	221.1500	31.9600	189.1900	0.1500	28.3785	110.0000	20810.9000	(29a)
main	88.3200		88.3200	0.1200	10.5984	9.0000	794.8800	(30)
over gf	15.5600		15.5600	0.1200	1.8672	9.0000	140.0400	(30)
Total net area of external elements Aum(A, m2)			428.9100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.5390			(33)
Internal Wall 1			298.7400			9.0000	2688.6600	(32c)
Internal Floor 1			88.3200			18.0000	1589.7600	(32d)
Internal Ceiling 1			88.3200			9.0000	794.8800	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		34610.1200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							180.0735	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	46.9100	0.0590	2.7677

E16 Corner (normal)	24.8000	0.0350	0.8680	
E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0660	-0.3168	
E12 Gable (insulation at ceiling level)	16.1600	0.0410	0.6626	
E10 Eaves (insulation at ceiling level)	34.7600	0.0640	2.2246	
E2 Other lintels (including other steel lintels)	24.1500	0.0310	0.7486	
E3 Sill	21.3600	0.0290	0.6194	
E4 Jamb	53.9000	0.0240	1.2936	
E6 Intermediate floor within a dwelling	28.6800	0.0010	0.0287	
E24 Eaves (insulation at ceiling level - inverted)	10.3000	0.1500	1.5450	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4415 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 98.9805 (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	85.0326	84.7994	84.5707	83.4969	83.2959	82.3606	82.3606	82.1874	82.7209	83.2959	83.7024	84.1273	(38)
Heat transfer coeff	184.0131	183.7799	183.5513	182.4774	182.2764	181.3411	181.3411	181.1679	181.7014	182.2764	182.6829	183.1078	(39)

Average = Sum(39)m / 12 = 182.4764

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9574	0.9562	0.9550	0.9494	0.9484	0.9435	0.9435	0.9426	0.9454	0.9484	0.9505	0.9527	(40)
HLP (average)												0.9494	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9918 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	74.3819	73.2641	71.6352	68.5186	66.2187	63.6538	62.1959	63.8125	65.5845	68.3384	71.5219	74.0969	(42a)
Hot water usage for baths	32.1099	31.6330	30.9614	29.7232	28.7961	27.7680	27.2127	27.8796	28.6056	29.7057	30.9694	32.0013	(42b)
Hot water usage for other uses	45.2686	43.6225	41.9764	40.3302	38.6841	37.0380	37.0380	38.6841	40.3302	41.9764	43.6225	45.2686	(42c)

Average daily hot water use (litres/day) 139.5018 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.7604	148.5196	144.5730	138.5721	133.6989	128.4598	126.4467	130.3762	134.5204	140.0205	146.1139	151.3669	(44)
Energy conte	240.3514	211.4899	222.2034	189.6983	179.9844	157.9564	152.9263	161.4329	165.8771	190.0065	208.1660	237.0039	(45)

Energy content (annual) Total = Sum(45)m = 2317.0966

Distribution loss (46)m = 0.15 x (45)m	36.0527	31.7235	33.3305	28.4547	26.9977	23.6935	22.9389	24.2149	24.8816	28.5010	31.2249	35.5506	(46)

Water storage loss:
Store volume 250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(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	293.7458	259.7171	275.5978	241.3703	233.3788	209.6284	206.3207	214.8273	217.5491	243.4009	259.8380	290.3983	(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	293.7458	259.7171	275.5978	241.3703	233.3788	209.6284	206.3207	214.8273	217.5491	243.4009	259.8380	290.3983	(64)

Total per year (kWh/year) = Sum(64)m = 2945.7726 (64)
12Total per year (kWh/year) 2946 (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	122.6324	108.9022	116.5981	104.4123	102.5603	93.8581	93.5635	96.3920	96.4917	105.8927	110.5528	121.5193	(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	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	198.0320	219.2497	198.0320	204.6331	198.0320	204.6331	198.0320	198.0320	204.6331	198.0320	204.6331	198.0320	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	363.5707	367.3435	357.8363	337.5967	312.0479	288.0355	271.9938	268.2211	277.7283	297.9679	323.5167	347.5290	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	(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)	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	(71)
Water heating gains (Table 5)	164.8284	162.0568	156.7179	145.0171	137.8499	130.3585	125.7574	129.5591	134.0163	142.3289	153.5455	163.3324	(72)
Total internal gains	794.3076	816.5264	780.4627	755.1233	715.8063	690.9035	663.6597	663.6887	684.2541	706.2052	749.5718	776.7699	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	10.2500	10.6334	0.7200	0.7000	0.7700	38.0679	(74)
East	2.0700	19.6403	0.7200	0.7000	0.7700	14.1998	(76)
South	12.4100	46.7521	0.7200	0.7000	0.7700	202.6452	(78)
West	1.3800	19.6403	0.7200	0.7000	0.7700	9.4665	(80)

Solar gains	264.3795	450.9267	622.6201	787.5686	901.6652	905.0184	868.3306	780.8492	678.9248	499.4980	316.6745	226.3014	(83)
Total gains	1058.6871	1267.4532	1403.0828	1542.6919	1617.4715	1595.9220	1531.9903	1444.5379	1363.1789	1205.7032	1066.2463	1003.0714	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.2458	52.3122	52.3773	52.6856	52.7436	53.0157	53.0157	53.0664	52.9106	52.7436	52.6263	52.5042	
alpha	4.4831	4.4875	4.4918	4.5124	4.5162	4.5344	4.5344	4.5378	4.5274	4.5162	4.5084	4.5003	
util living area													
	0.9945	0.9871	0.9725	0.9306	0.8374	0.6707	0.5075	0.5558	0.7832	0.9486	0.9883	0.9956	(86)
Living	19.4852	19.7191	20.0269	20.4198	20.7439	20.9322	20.9846	20.9770	20.8601	20.4349	19.8842	19.4404	
Non living	18.3298	18.6283	19.0186	19.5089	19.8884	20.0833	20.1237	20.1202	20.0191	19.5358	18.8438	18.2754	
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	20.2251	19.7191	20.0269	20.4198	20.7439	20.9322	20.9846	20.9770	20.8601	20.4349	19.8842	19.6585	(87)
Th 2	20.1190	20.1200	20.1210	20.1257	20.1266	20.1307	20.1307	20.1314	20.1291	20.1266	20.1248	20.1229	(88)
util rest of house													
	0.9931	0.9841	0.9658	0.9131	0.7969	0.5977	0.4132	0.4599	0.7200	0.9321	0.9850	0.9946	(89)
MIT 2	19.4057	18.6283	19.0186	19.5089	19.8884	20.0833	20.1237	20.1202	20.0191	19.5358	18.8438	18.6083	(90)
Living area fraction										fLA = Living area / (4) =		0.1494	(91)
MIT	19.5281	18.7913	19.1692	19.6450	20.0162	20.2101	20.2523	20.2482	20.1447	19.6701	18.9992	18.7652	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5281	18.7913	19.1692	19.6450	20.0162	20.2101	20.2523	20.2482	20.1447	19.6701	18.9992	18.7652	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9920	0.9778	0.9563	0.9015	0.7912	0.6048	0.4268	0.4733	0.7213	0.9211	0.9791	0.9923	(94)
Useful gains	1050.2600	1239.2893	1341.7299	1390.6835	1279.7283	965.1401	653.8466	683.7040	983.2033	1110.5865	1043.9127	995.3583	(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													
	2802.1696	2552.9382	2325.4506	1960.7127	1515.8530	1017.3378	662.3190	697.1685	1098.3310	1653.2614	2173.7746	2666.9981	(97)
Space heating kWh													
	1303.4207	882.7720	731.8882	410.4210	175.6767	0.0000	0.0000	0.0000	0.0000	403.7501	813.5006	1243.6999	(98a)
Space heating requirement - total per year (kWh/year)												5965.1294	
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													
	1303.4207	882.7720	731.8882	410.4210	175.6767	0.0000	0.0000	0.0000	0.0000	403.7501	813.5006	1243.6999	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5965.1294	
Space heating per m2											(98c) / (4) =	31.0361	(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 %)	254.0684 (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													
	1303.4207	882.7720	731.8882	410.4210	175.6767	0.0000	0.0000	0.0000	0.0000	403.7501	813.5006	1243.6999	(98)
Space heating efficiency (main heating system 1)													
	254.0684	254.0684	254.0684	254.0684	254.0684	0.0000	0.0000	0.0000	0.0000	254.0684	254.0684	254.0684	(210)
Space heating fuel (main heating system)													
	513.0197	347.4545	288.0674	161.5396	69.1454	0.0000	0.0000	0.0000	0.0000	158.9140	320.1896	489.5139	(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													
	293.7458	259.7171	275.5978	241.3703	233.3788	209.6284	206.3207	214.8273	217.5491	243.4009	259.8380	290.3983	(64)
Efficiency of water heater												171.7726	(216)
(217)m	171.7726	171.7726	171.7726	171.7726	171.7726	171.7726	171.7726	171.7726	171.7726	171.7726	171.7726	171.7726	(217)
Fuel for water heating, kWh/month													
	171.0085	151.1982	160.4434	140.5174	135.8650	122.0383	120.1127	125.0650	126.6495	141.6995	151.2686	169.0598	(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	51.0094	40.9216	36.8454	26.9945	20.8513	17.0357	19.0213	24.7246	32.1148	42.1364	47.5929	52.4271	(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	2347.8441 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	171.7726
Water heating fuel used	1714.9257 (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)	411.6752	(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	4474.4450	(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	2347.8441	0.1556	365.2683	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1714.9257	0.1410	241.7471	(264)
Space and water heating			607.0154	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	411.6752	0.1443	59.4175	(268)
Total CO2, kg/year			666.4329	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4700	(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	2347.8441	1.5759	3700.0593	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1714.9257	1.5212	2608.8247	(278)
Space and water heating			6308.8841	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	411.6752	1.5338	631.4412	(282)
Total Primary energy kWh/year			6940.3252	(286)
Dwelling Primary energy Rate (DPER)			36.1100	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	103.8800 (1b)	x	2.4000 (2b)	=	249.3120	(1b) - (3b)
First floor	88.3200 (1c)	x	2.6000 (2c)	=	229.6320	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 192.2000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	478.9440	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0835	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3335	(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) =	0.2835	(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	0.3614	0.3544	0.3473	0.3118	0.3048	0.2693	0.2693	0.2622	0.2835	0.3048	0.3189	0.3331	(22b)
Effective ac	0.5653	0.5628	0.5603	0.5486	0.5464	0.5363	0.5363	0.5344	0.5402	0.5464	0.5509	0.5555	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			5.8500	1.0000	5.8500			(26)
TER Opening Type (Uw = 1.20)			26.1100	1.1450	29.8969			(27)
Heatloss Floor 1			103.8800	0.1300	13.5044			(28a)
External Wall 1	221.1500	31.9600	189.1900	0.1800	34.0542			(29a)
main	88.3200		88.3200	0.1100	9.7152			(30)
over gf	15.5600		15.5600	0.1100	1.7116			(30)
Total net area of external elements Aum(A, m2)			428.9100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		94.7323			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 180.0735 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	46.9100	0.1600	7.5056
E16 Corner (normal)	24.8000	0.0900	2.2320
E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0900	-0.4320
E12 Gable (insulation at ceiling level)	16.1600	0.0600	0.9696
E10 Eaves (insulation at ceiling level)	34.7600	0.0600	2.0856
E2 Other lintels (including other steel lintels)	24.1500	0.0500	1.2075
E3 Sill	21.3600	0.0500	1.0680
E4 Jamb	53.9000	0.0500	2.6950
E6 Intermediate floor within a dwelling	28.6800	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	10.3000	0.2400	2.4720

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.8033 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 114.5356 (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	89.3501	88.9492	88.5562	86.7105	86.3651	84.7575	84.7575	84.4598	85.3768	86.3651	87.0638	87.7941	(38)
Heat transfer coeff	203.8858	203.4849	203.0919	201.2461	200.9008	199.2932	199.2932	198.9955	199.9124	200.9008	201.5994	202.3298	(39)

Average = Sum(39)m / 12 = 201.2445

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0608	1.0587	1.0567	1.0471	1.0453	1.0369	1.0369	1.0354	1.0401	1.0453	1.0489	1.0527	(40)
HLP (average)												1.0471	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9918 (42)

Hot water usage for mixer showers

74.3819	73.2641	71.6352	68.5186	66.2187	63.6538	62.1959	63.8125	65.5845	68.3384	71.5219	74.0969	(42a)

Hot water usage for baths

32.1099	31.6330	30.9614	29.7232	28.7961	27.7680	27.2127	27.8796	28.6056	29.7057	30.9694	32.0013	(42b)

Hot water usage for other uses

45.2686	43.6225	41.9764	40.3302	38.6841	37.0380	37.0380	38.6841	40.3302	41.9764	43.6225	45.2686	(42c)

Average daily hot water use (litres/day) 139.5018 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.7604	148.5196	144.5730	138.5721	133.6989	128.4598	126.4467	130.3762	134.5204	140.0205	146.1139	151.3669	(44)
Energy conte	240.3514	211.4899	222.2034	189.6983	179.9844	157.9564	152.9263	161.4329	165.8771	190.0065	208.1660	237.0039	(45)
Energy content (annual)										Total = Sum(45)m =		2317.0966	
Distribution loss (46)m = 0.15 x (45)m	36.0527	31.7235	33.3305	28.4547	26.9977	23.6935	22.9389	24.2149	24.8816	28.5010	31.2249	35.5506	(46)

Water storage loss:

Store volume 250.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.8903 (48)

Temperature factor from Table 2b 0.5400 (49)

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

Total storage loss

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

If cylinder contains dedicated solar storage

31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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

295.2582	261.0831	277.1102	242.8339	234.8912	211.0920	207.8331	216.3397	219.0127	244.9133	261.3016	291.9107	(62)
WWHRS -34.0043	-30.0737	-31.4914	-26.0761	-24.3020	-20.7954	-19.4924	-20.7282	-21.5157	-25.3647	-28.7351	-33.3746	(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

261.2539	231.0095	245.6187	216.7578	210.5892	190.2965	188.3407	195.6115	197.4970	219.5486	232.5665	258.5361	(64)

Total per year (kWh/year) = Sum(64)m = 2647.6260 (64)

12Total per year (kWh/year) 2648 (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

123.8423	109.9950	117.8081	105.5832	103.7703	95.0290	94.7734	97.6019	97.6626	107.1026	111.7237	122.7292	(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	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	198.0320	219.2497	198.0320	204.6331	198.0320	204.6331	198.0320	198.0320	204.6331	198.0320	204.6331	198.0320	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	363.5707	367.3435	357.8363	337.5967	312.0479	288.0355	271.9938	268.2211	277.7283	297.9679	323.5167	347.5290	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	(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)	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	(71)
Water heating gains (Table 5)	166.4547	163.6830	158.3442	146.6433	139.4762	131.9847	127.3836	131.1853	135.6425	143.9551	155.1718	164.9587	(72)

Total internal gains

	798.9339	821.1527	785.0889	759.7496	720.4325	692.5298	665.2859	665.3149	685.8803	710.8314	754.1980	781.3962 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	10.2500	10.6334	0.6300	0.7000	0.7700	33.3095	(74)
East	2.0700	19.6403	0.6300	0.7000	0.7700	12.4248	(76)
South	12.4100	46.7521	0.6300	0.7000	0.7700	177.3146	(78)
West	1.3800	19.6403	0.6300	0.7000	0.7700	8.2832	(80)

Solar gains	231.3320	394.5609	544.7926	689.1225	788.9571	791.8911	759.7893	683.2430	594.0592	437.0607	277.0902	198.0138 (83)
Total gains	1030.2659	1215.7135	1329.8816	1448.8721	1509.3896	1484.4209	1425.0752	1348.5579	1279.9395	1147.8922	1031.2882	979.4099 (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	47.1535	47.2464	47.3378	47.7720	47.8541	48.2401	48.2401	48.3123	48.0907	47.8541	47.6882	47.5161	
alpha	4.1436	4.1498	4.1559	4.1848	4.1903	4.2160	4.2160	4.2208	4.2060	4.1903	4.1792	4.1677	
util living area	0.9951	0.9897	0.9795	0.9505	0.8826	0.7426	0.5821	0.6298	0.8369	0.9617	0.9903	0.9960	(86)
MIT	19.2596	19.4832	19.7978	20.2238	20.6065	20.8726	20.9652	20.9514	20.7735	20.2766	19.6938	19.2241	(87)
Th 2	20.0330	20.0347	20.0364	20.0443	20.0458	20.0527	20.0527	20.0540	20.0500	20.0458	20.0428	20.0396	(88)
util rest of house	0.9938	0.9871	0.9741	0.9365	0.8472	0.6665	0.4710	0.5201	0.7772	0.9481	0.9874	0.9950	(89)
MIT 2	17.9836	18.2699	18.6709	19.2103	19.6710	19.9609	20.0367	20.0297	19.8664	19.2834	18.5455	17.9426	(90)
Living area fraction									fLA = Living area / (4) =			0.1494	(91)
MIT	18.1742	18.4511	18.8392	19.3617	19.8108	20.0971	20.1754	20.1674	20.0019	19.4318	18.7170	18.1340	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1742	18.4511	18.8392	19.3617	19.8108	20.0971	20.1754	20.1674	20.0019	19.4318	18.7170	18.1340	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9903	0.9810	0.9649	0.9237	0.8369	0.6704	0.4862	0.5342	0.7737	0.9364	0.9816	0.9920	(94)
Useful gains	1020.2402	1192.6562	1283.2575	1338.3879	1263.2288	995.2221	692.8552	720.3911	990.2623	1074.9329	1012.2820	971.5802	(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	2828.7581	2757.4513	2505.9975	2105.3714	1629.4581	1095.5247	712.5582	749.6882	1179.8624	1774.3149	2341.9886	2819.2696	(97)
Space heating kWh	1345.5373	1051.5423	909.7185	552.2282	272.4746	0.0000	0.0000	0.0000	0.0000	520.3402	957.3887	1374.6809	(98a)
Space heating requirement - total per year (kWh/year)												6983.9107	
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	1345.5373	1051.5423	909.7185	552.2282	272.4746	0.0000	0.0000	0.0000	0.0000	520.3402	957.3887	1374.6809	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6983.9107	
Space heating per m2											(98c) / (4) =	36.3367	(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	1345.5373	1051.5423	909.7185	552.2282	272.4746	0.0000	0.0000	0.0000	0.0000	520.3402	957.3887	1374.6809	(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)	1457.7869	1139.2657	985.6105	598.2970	295.2054	0.0000	0.0000	0.0000	0.0000	563.7489	1037.2575	1489.3618	(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	261.2539	231.0095	245.6187	216.7578	210.5892	190.2965	188.3407	195.6115	197.4970	219.5486	232.5665	258.5361	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2009	87.0320	86.7207	86.0640	84.6386	79.8000	79.8000	79.8000	79.8000	85.9245	86.8849	87.2424	(217)
Fuel for water heating, kWh/month	299.5998	265.4304	283.2296	251.8565	248.8099	238.4668	236.0159	245.1272	247.4900	255.5136	267.6720	296.3422	(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	41.1471	33.0098	29.7216	21.7753	16.8199	13.7420	15.3437	19.9443	25.9057	33.9896	38.3912	42.2907	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-85.4597	-114.9311	-157.5771	-168.5876	-174.6777	-160.3353	-158.1173	-152.5368	-141.9586	-127.0036	-91.8559	-74.5324	(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	-66.6411	-137.6058	-268.9947	-397.7692	-520.2115	-520.8404	-514.9096	-438.7254	-325.1467	-194.8869	-88.3090	-52.9159	(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	7566.5338	(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	3135.5539	(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)	332.0810	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-5134.5293	(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	5985.6395	(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	7566.5338	0.2100	1588.9721	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3135.5539	0.2100	658.4663	(264)
Space and water heating			2247.4384	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	332.0810	0.1443	47.9296	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1607.5731	0.1357	-218.0795	
PV Unit electricity exported	-3526.9562	0.1264	-445.6382	
Total			-663.7177	(269)
Total CO2, kg/year			1643.5795	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.5500	(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	7566.5338	1.1300	8550.1832	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3135.5539	1.1300	3543.1760	(278)
Space and water heating			12093.3592	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	332.0810	1.5338	509.3570	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1607.5731	1.5014	-2413.6533	
PV Unit electricity exported	-3526.9562	0.4638	-1635.8678	
Total			-4049.5211	(283)
Total Primary energy kWh/year			8683.2959	(286)
Target Primary Energy Rate (TPER)			45.1800	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 7	Assessment Date	27/09/2024
Property Reference (cont.)	00001	Date of Test	
Address	Plot 7 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

SAP Rating	82 B	DER	3.51	TER	8.70
Environment	96 A	% DER < TER			59.66
CO2 Emissions (tonnes)	0.58	DFEE	34.82	TFEE	41.46
Compliance Check	See BREL	% DFEE < TFEE			16.03
Assessor's Name	20.47	DPER	36.55	TPER	45.96

Assessor Name	Mr. Neil Rothon	Accreditation	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	103.8800	(1b)	x 2.4000	(2b) =	249.3120	(1b) - (3b)
First floor	88.3200	(1c)	x 2.6000	(2c) =	229.6320	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	192.2000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		478.9440	(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	5 * 10 =	50.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) =	0.1044	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2544	(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) =	0.2162	(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	0.2757	0.2703	0.2649	0.2379	0.2325	0.2054	0.2054	0.2000	0.2162	0.2325	0.2433	0.2541	(22b)
Effective ac	0.5380	0.5365	0.5351	0.5283	0.5270	0.5211	0.5211	0.5200	0.5234	0.5270	0.5296	0.5323	(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	
Front door			1.9500	1.2000	2.3400			(26)
side door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			26.1100	1.1450	29.8969			(27)
to garage			1.9500	1.4000	2.7300			(26)
Heatloss Floor 1			103.8800	0.1000	10.3880	75.0000	7791.0000	(28a)
External Wall 1	221.1500	31.9600	189.1900	0.1500	28.3785	110.0000	20810.9000	(29a)
main	88.3200		88.3200	0.1200	10.5984	9.0000	794.8800	(30)
over gf	15.5600		15.5600	0.1200	1.8672	9.0000	140.0400	(30)
Total net area of external elements Aum(A, m2)			428.9100					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.5390			(33)
Internal Wall 1			298.7400			9.0000	2688.6600	(32c)
Internal Floor 1			88.3200			18.0000	1589.7600	(32d)
Internal Ceiling 1			88.3200			9.0000	794.8800	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	34610.1200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		180.0735 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	46.9100	0.0590	2.7677

E16 Corner (normal)	24.8000	0.0350	0.8680	
E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0660	-0.3168	
E12 Gable (insulation at ceiling level)	16.1600	0.0410	0.6626	
E10 Eaves (insulation at ceiling level)	34.7600	0.0640	2.2246	
E2 Other lintels (including other steel lintels)	24.1500	0.0310	0.7486	
E3 Sill	21.3600	0.0290	0.6194	
E4 Jamb	53.9000	0.0240	1.2936	
E6 Intermediate floor within a dwelling	28.6800	0.0010	0.0287	
E24 Eaves (insulation at ceiling level - inverted)	10.3000	0.1500	1.5450	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.4415 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 98.9805 (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	85.0326	84.7994	84.5707	83.4969	83.2959	82.3606	82.3606	82.1874	82.7209	83.2959	83.7024	84.1273	(38)
Heat transfer coeff	184.0131	183.7799	183.5513	182.4774	182.2764	181.3411	181.3411	181.1679	181.7014	182.2764	182.6829	183.1078	(39)

Average = Sum(39)m / 12 = 182.4764

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9574	0.9562	0.9550	0.9494	0.9484	0.9435	0.9435	0.9426	0.9454	0.9484	0.9505	0.9527	(40)
HLP (average)												0.9494	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9918 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	74.3819	73.2641	71.6352	68.5186	66.2187	63.6538	62.1959	63.8125	65.5845	68.3384	71.5219	74.0969	(42a)
Hot water usage for baths	32.1099	31.6330	30.9614	29.7232	28.7961	27.7680	27.2127	27.8796	28.6056	29.7057	30.9694	32.0013	(42b)
Hot water usage for other uses	45.2686	43.6225	41.9764	40.3302	38.6841	37.0380	37.0380	38.6841	40.3302	41.9764	43.6225	45.2686	(42c)

Average daily hot water use (litres/day) 139.5018 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.7604	148.5196	144.5730	138.5721	133.6989	128.4598	126.4467	130.3762	134.5204	140.0205	146.1139	151.3669	(44)
Energy conte	240.3514	211.4899	222.2034	189.6983	179.9844	157.9564	152.9263	161.4329	165.8771	190.0065	208.1660	237.0039	(45)

Energy content (annual) Total = Sum(45)m = 2317.0966

Distribution loss (46)m = 0.15 x (45)m	36.0527	31.7235	33.3305	28.4547	26.9977	23.6935	22.9389	24.2149	24.8816	28.5010	31.2249	35.5506	(46)

Water storage loss:
Store volume 250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8000 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9720 (55)
Total storage loss

	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(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	293.7458	259.7171	275.5978	241.3703	233.3788	209.6284	206.3207	214.8273	217.5491	243.4009	259.8380	290.3983	(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	293.7458	259.7171	275.5978	241.3703	233.3788	209.6284	206.3207	214.8273	217.5491	243.4009	259.8380	290.3983	(64)

Total per year (kWh/year) = Sum(64)m = 2945.7726 (64)
12Total per year (kWh/year) 2946 (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	122.6324	108.9022	116.5981	104.4123	102.5603	93.8581	93.5635	96.3920	96.4917	105.8927	110.5528	121.5193	(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	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	198.0320	219.2497	198.0320	204.6331	198.0320	204.6331	198.0320	198.0320	204.6331	198.0320	204.6331	198.0320	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	363.5707	367.3435	357.8363	337.5967	312.0479	288.0355	271.9938	268.2211	277.7283	297.9679	323.5167	347.5290	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	(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)	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	(71)
Water heating gains (Table 5)	164.8284	162.0568	156.7179	145.0171	137.8499	130.3585	125.7574	129.5591	134.0163	142.3289	153.5455	163.3324	(72)
Total internal gains	794.3076	816.5264	780.4627	755.1233	715.8063	690.9035	663.6597	663.6887	684.2541	706.2052	749.5718	776.7699	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	12.4100	10.6334	0.7200	0.7000	0.7700	46.0901	(74)
East	2.0700	19.6403	0.7200	0.7000	0.7700	14.1998	(76)
South	10.2500	46.7521	0.7200	0.7000	0.7700	167.3742	(78)
West	1.3800	19.6403	0.7200	0.7000	0.7700	9.4665	(80)

Solar gains	237.1305	408.4925	575.0885	746.2487	871.3709	881.9613	843.1815	746.4109	633.3807	455.4423	284.7626	202.5117	(83)
Total gains	1031.4382	1225.0190	1355.5512	1501.3720	1587.1772	1572.8649	1506.8413	1410.0996	1317.6349	1161.6475	1034.3344	979.2816	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.2458	52.3122	52.3773	52.6856	52.7436	53.0157	53.0157	53.0664	52.9106	52.7436	52.6263	52.5042	
alpha	4.4831	4.4875	4.4918	4.5124	4.5162	4.5344	4.5344	4.5378	4.5274	4.5162	4.5084	4.5003	
util living area													
	0.9950	0.9887	0.9757	0.9362	0.8446	0.6780	0.5151	0.5675	0.7981	0.9545	0.9896	0.9960	(86)
Living	19.4653	19.6891	19.9955	20.3972	20.7335	20.9291	20.9837	20.9751	20.8480	20.4087	19.8615	19.4229	
Non living	18.3044	18.5904	18.9794	19.4822	19.8776	20.0809	20.1233	20.1191	20.0083	19.5045	18.8151	18.2530	
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	20.2149	19.6891	19.9955	20.3972	20.7335	20.9291	20.9837	20.9751	20.8480	20.4087	19.8615	19.6435	(87)
Th 2	20.1190	20.1200	20.1210	20.1257	20.1266	20.1307	20.1307	20.1314	20.1291	20.1266	20.1248	20.1229	(88)
util rest of house													
	0.9938	0.9860	0.9697	0.9198	0.8050	0.6049	0.4198	0.4704	0.7364	0.9395	0.9866	0.9951	(89)
MIT 2	19.3956	18.5904	18.9794	19.4822	19.8776	20.0809	20.1233	20.1191	20.0083	19.5045	18.8151	18.5900	(90)
Living area fraction										fLA = Living area / (4) =		0.1494	(91)
MIT	19.5180	18.7545	19.1312	19.6189	20.0054	20.2076	20.2518	20.2470	20.1337	19.6396	18.9714	18.7474	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5180	18.7545	19.1312	19.6189	20.0054	20.2076	20.2518	20.2470	20.1337	19.6396	18.9714	18.7474	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9928	0.9802	0.9607	0.9082	0.7988	0.6118	0.4335	0.4838	0.7368	0.9288	0.9811	0.9930	(94)
Useful gains	1024.0050	1200.7396	1302.2262	1363.5123	1267.9063	962.2627	653.2042	682.2550	970.8079	1078.9415	1014.7908	972.3966	(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													
	2800.3064	2546.1826	2318.4751	1955.9552	1513.8818	1016.8974	662.2230	696.9519	1096.3388	1647.7064	2168.6993	2663.7359	(97)
Space heating kWh													
	1321.5683	904.1377	756.0891	426.5588	183.0058	0.0000	0.0000	0.0000	0.0000	423.1611	830.8141	1258.3564	(98a)
Space heating requirement - total per year (kWh/year)												6103.6913	
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													
	1321.5683	904.1377	756.0891	426.5588	183.0058	0.0000	0.0000	0.0000	0.0000	423.1611	830.8141	1258.3564	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6103.6913	
Space heating per m2											(98c) / (4) =	31.7570	(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 %)	254.0684 (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													
	1321.5683	904.1377	756.0891	426.5588	183.0058	0.0000	0.0000	0.0000	0.0000	423.1611	830.8141	1258.3564	(98)
Space heating efficiency (main heating system 1)													
	254.0684	254.0684	254.0684	254.0684	254.0684	0.0000	0.0000	0.0000	0.0000	254.0684	254.0684	254.0684	(210)
Space heating fuel (main heating system)													
	520.1624	355.8639	297.5928	167.8913	72.0301	0.0000	0.0000	0.0000	0.0000	166.5540	327.0041	495.2826	(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													
	293.7458	259.7171	275.5978	241.3703	233.3788	209.6284	206.3207	214.8273	217.5491	243.4009	259.8380	290.3983	(64)
Efficiency of water heater												171.7726	(216)
(217)m	171.7726	171.7726	171.7726	171.7726	171.7726	171.7726	171.7726	171.7726	171.7726	171.7726	171.7726	171.7726	(217)
Fuel for water heating, kWh/month													
	171.0085	151.1982	160.4434	140.5174	135.8650	122.0383	120.1127	125.0650	126.6495	141.6995	151.2686	169.0598	(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	51.0094	40.9216	36.8454	26.9945	20.8513	17.0357	19.0213	24.7246	32.1148	42.1364	47.5929	52.4271	(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	2402.3813 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	171.7726
Water heating fuel used	1714.9257 (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)	411.6752	(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	4528.9822	(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	2402.3813	0.1555	373.5329	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1714.9257	0.1410	241.7471	(264)
Space and water heating			615.2800	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	411.6752	0.1443	59.4175	(268)
Total CO2, kg/year			674.6975	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5100	(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	2402.3813	1.5756	3785.2024	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1714.9257	1.5212	2608.8247	(278)
Space and water heating			6394.0271	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	411.6752	1.5338	631.4412	(282)
Total Primary energy kWh/year			7025.4683	(286)
Dwelling Primary energy Rate (DPER)			36.5500	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	103.8800 (1b)	x	2.4000 (2b)	=	249.3120	(1b) - (3b)
First floor	88.3200 (1c)	x	2.6000 (2c)	=	229.6320	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 192.2000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	478.9440	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0835	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3335	(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) =	0.2835	(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	0.3614	0.3544	0.3473	0.3118	0.3048	0.2693	0.2693	0.2622	0.2835	0.3048	0.3189	0.3331	(22b)
Effective ac	0.5653	0.5628	0.5603	0.5486	0.5464	0.5363	0.5363	0.5344	0.5402	0.5464	0.5509	0.5555	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			5.8500	1.0000	5.8500			(26)
TER Opening Type (Uw = 1.20)			26.1100	1.1450	29.8969			(27)
Heatloss Floor 1			103.8800	0.1300	13.5044			(28a)
External Wall 1	221.1500	31.9600	189.1900	0.1800	34.0542			(29a)
main	88.3200		88.3200	0.1100	9.7152			(30)
over gf	15.5600		15.5600	0.1100	1.7116			(30)
Total net area of external elements Aum(A, m2)			428.9100					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		94.7323			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 180.0735 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	46.9100	0.1600	7.5056
E16 Corner (normal)	24.8000	0.0900	2.2320
E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0900	-0.4320
E12 Gable (insulation at ceiling level)	16.1600	0.0600	0.9696
E10 Eaves (insulation at ceiling level)	34.7600	0.0600	2.0856
E2 Other lintels (including other steel lintels)	24.1500	0.0500	1.2075
E3 Sill	21.3600	0.0500	1.0680
E4 Jamb	53.9000	0.0500	2.6950
E6 Intermediate floor within a dwelling	28.6800	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	10.3000	0.2400	2.4720

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.8033 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 114.5356 (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	89.3501	88.9492	88.5562	86.7105	86.3651	84.7575	84.7575	84.4598	85.3768	86.3651	87.0638	87.7941	(38)
Heat transfer coeff	203.8858	203.4849	203.0919	201.2461	200.9008	199.2932	199.2932	198.9955	199.9124	200.9008	201.5994	202.3298	(39)

Average = Sum(39)m / 12 = 201.2445

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0608	1.0587	1.0567	1.0471	1.0453	1.0369	1.0369	1.0354	1.0401	1.0453	1.0489	1.0527	(40)
HLP (average)												1.0471	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9918 (42)

Hot water usage for mixer showers

74.3819	73.2641	71.6352	68.5186	66.2187	63.6538	62.1959	63.8125	65.5845	68.3384	71.5219	74.0969	(42a)

Hot water usage for baths

32.1099	31.6330	30.9614	29.7232	28.7961	27.7680	27.2127	27.8796	28.6056	29.7057	30.9694	32.0013	(42b)

Hot water usage for other uses

45.2686	43.6225	41.9764	40.3302	38.6841	37.0380	37.0380	38.6841	40.3302	41.9764	43.6225	45.2686	(42c)

Average daily hot water use (litres/day) 139.5018 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.7604	148.5196	144.5730	138.5721	133.6989	128.4598	126.4467	130.3762	134.5204	140.0205	146.1139	151.3669	(44)
Energy conte	240.3514	211.4899	222.2034	189.6983	179.9844	157.9564	152.9263	161.4329	165.8771	190.0065	208.1660	237.0039	(45)
Energy content (annual)										Total = Sum(45)m =		2317.0966	
Distribution loss (46)m = 0.15 x (45)m	36.0527	31.7235	33.3305	28.4547	26.9977	23.6935	22.9389	24.2149	24.8816	28.5010	31.2249	35.5506	(46)

Water storage loss:

Store volume 250.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.8903 (48)

Temperature factor from Table 2b 0.5400 (49)

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

Total storage loss

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

If cylinder contains dedicated solar storage

31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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

295.2582	261.0831	277.1102	242.8339	234.8912	211.0920	207.8331	216.3397	219.0127	244.9133	261.3016	291.9107	(62)
WWHRS -34.0043	-30.0737	-31.4914	-26.0761	-24.3020	-20.7954	-19.4924	-20.7282	-21.5157	-25.3647	-28.7351	-33.3746	(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

261.2539	231.0095	245.6187	216.7578	210.5892	190.2965	188.3407	195.6115	197.4970	219.5486	232.5665	258.5361	(64)

Total per year (kWh/year) = Sum(64)m = 2647.6260 (64)

12Total per year (kWh/year) 2648 (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

123.8423	109.9950	117.8081	105.5832	103.7703	95.0290	94.7734	97.6019	97.6626	107.1026	111.7237	122.7292	(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	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	149.5882	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	198.0320	219.2497	198.0320	204.6331	198.0320	204.6331	198.0320	198.0320	204.6331	198.0320	204.6331	198.0320	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	363.5707	367.3435	357.8363	337.5967	312.0479	288.0355	271.9938	268.2211	277.7283	297.9679	323.5167	347.5290	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	37.9588	(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)	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	-119.6705	(71)
Water heating gains (Table 5)	166.4547	163.6830	158.3442	146.6433	139.4762	131.9847	127.3836	131.1853	135.6425	143.9551	155.1718	164.9587	(72)

Total internal gains

	798.9339	821.1527	785.0889	759.7496	720.4325	692.5298	665.2859	665.3149	685.8803	710.8314	754.1980	781.3962 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	12.4100	10.6334	0.6300	0.7000	0.7700	40.3288	(74)
East	2.0700	19.6403	0.6300	0.7000	0.7700	12.4248	(76)
South	10.2500	46.7521	0.6300	0.7000	0.7700	146.4524	(78)
West	1.3800	19.6403	0.6300	0.7000	0.7700	8.2832	(80)

Solar gains	207.4892	357.4310	503.2024	652.9676	762.4496	771.7162	737.7838	653.1096	554.2081	398.5120	249.1673	177.1977 (83)
Total gains	1006.4231	1178.5836	1288.2914	1412.7171	1482.8821	1464.2459	1403.0698	1318.4245	1240.0885	1109.3435	1003.3653	958.5939 (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	47.1535	47.2464	47.3378	47.7720	47.8541	48.2401	48.2401	48.3123	48.0907	47.8541	47.6882	47.5161	
alpha	4.1436	4.1498	4.1559	4.1848	4.1903	4.2160	4.2160	4.2208	4.2060	4.1903	4.1792	4.1677	
util living area	0.9955	0.9908	0.9816	0.9543	0.8879	0.7488	0.5896	0.6408	0.8483	0.9657	0.9912	0.9963	(86)
MIT	19.2426	19.4573	19.7700	20.2025	20.5950	20.8683	20.9635	20.9481	20.7594	20.2527	19.6742	19.2091	(87)
Th 2	20.0330	20.0347	20.0364	20.0443	20.0458	20.0527	20.0527	20.0540	20.0500	20.0458	20.0428	20.0396	(88)
util rest of house	0.9944	0.9885	0.9768	0.9411	0.8534	0.6732	0.4777	0.5305	0.7907	0.9533	0.9886	0.9954	(89)
MIT 2	17.9619	18.2370	18.6360	19.1845	19.6585	19.9573	20.0359	20.0278	19.8530	19.2545	18.5207	17.9235	(90)
Living area fraction									fLA = Living area / (4) =			0.1494	(91)
MIT	18.1532	18.4193	18.8054	19.3366	19.7984	20.0934	20.1744	20.1653	19.9884	19.4036	18.6930	18.1155	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1532	18.4193	18.8054	19.3366	19.7984	20.0934	20.1744	20.1653	19.9884	19.4036	18.6930	18.1155	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9910	0.9828	0.9681	0.9286	0.8428	0.6768	0.4929	0.5445	0.7863	0.9421	0.9831	0.9926	(94)
Useful gains	997.3732	1158.3366	1247.1895	1311.8351	1249.8017	990.9342	691.6284	717.8497	975.0998	1045.0643	986.4368	951.4761	(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	2824.4658	2750.9642	2499.1263	2100.3211	1626.9788	1094.8007	712.3611	749.2774	1177.1621	1768.6438	2337.1397	2815.5249	(97)
Space heating kWh	1359.3569	1070.2458	931.4410	567.7099	280.6197	0.0000	0.0000	0.0000	0.0000	538.3431	972.5062	1386.8523	(98a)
Space heating requirement - total per year (kWh/year)												7107.0749	
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	1359.3569	1070.2458	931.4410	567.7099	280.6197	0.0000	0.0000	0.0000	0.0000	538.3431	972.5062	1386.8523	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7107.0749	
Space heating per m2											(98c) / (4) =	36.9775	(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	1359.3569	1070.2458	931.4410	567.7099	280.6197	0.0000	0.0000	0.0000	0.0000	538.3431	972.5062	1386.8523	(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)	1472.7594	1159.5295	1009.1452	615.0703	304.0301	0.0000	0.0000	0.0000	0.0000	583.2537	1053.6361	1502.5486	(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	261.2539	231.0095	245.6187	216.7578	210.5892	190.2965	188.3407	195.6115	197.4970	219.5486	232.5665	258.5361	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.2143	87.0569	86.7582	86.1164	84.7044	79.8000	79.8000	79.8000	79.8000	85.9906	86.9084	87.2538	(217)
Fuel for water heating, kWh/month	299.5538	265.3544	283.1072	251.7034	248.6165	238.4668	236.0159	245.1272	247.4900	255.3170	267.5996	296.3037	(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	41.1471	33.0098	29.7216	21.7753	16.8199	13.7420	15.3437	19.9443	25.9057	33.9896	38.3912	42.2907	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-85.4597	-114.9311	-157.5771	-168.5876	-174.6777	-160.3353	-158.1173	-152.5368	-141.9586	-127.0036	-91.8559	-74.5324	(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	-66.6411	-137.6058	-268.9947	-397.7692	-520.2115	-520.8404	-514.9096	-438.7254	-325.1467	-194.8869	-88.3090	-52.9159	(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	7699.9728	(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	3134.6557	(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)	332.0810	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-5134.5293	(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	6118.1803	(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	7699.9728	0.2100	1616.9943	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3134.6557	0.2100	658.2777	(264)
Space and water heating			2275.2720	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	332.0810	0.1443	47.9296	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1607.5731	0.1357	-218.0795	
PV Unit electricity exported	-3526.9562	0.1264	-445.6382	
Total			-663.7177	(269)
Total CO2, kg/year			1671.4131	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.7000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	7699.9728	1.1300	8700.9693	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3134.6557	1.1300	3542.1609	(278)
Space and water heating			12243.1302	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	332.0810	1.5338	509.3570	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1607.5731	1.5014	-2413.6533	
PV Unit electricity exported	-3526.9562	0.4638	-1635.8678	
Total			-4049.5211	(283)
Total Primary energy kWh/year			8833.0669	(286)
Target Primary Energy Rate (TPER)			45.9600	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 8	Assessment Date	27/09/2024
Property Reference (cont.)	00001	Dwelling Type	
Address	Plot 8 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

SAP Rating	81 B	DER	3.86	TER	9.66
Environmental	96 A	% DER < TER			60.04
CO2 Emissions (tonnes)	0.58	DFEE	37.89	TFEE	44.51
General Requirements	See BREL	Target Fabric			14.86
Assessor's Name	21.13	DPER	40.18	TPER	50.94

Assessor Name	Mr. Neil Rothon	Accreditation	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	93.2800 (1b)	x	2.4000 (2b)	=	223.8720	(1b) - (3b)
First floor	78.6500 (1c)	x	2.6000 (2c)	=	204.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.9300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	428.3620	(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	5 * 10 =	50.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) =	0.1167	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2667	(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) =	0.2267	(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	0.2891	0.2834	0.2777	0.2494	0.2437	0.2154	0.2154	0.2097	0.2267	0.2437	0.2551	0.2664	(22b)
Effective ac	0.5418	0.5402	0.5386	0.5311	0.5297	0.5232	0.5232	0.5220	0.5257	0.5297	0.5325	0.5355	(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	
Front door			1.9500	1.2000	2.3400			(26)
side door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			27.1500	1.1450	31.0878			(27)
Heatloss Floor 1			93.2800	0.1000	9.3280	75.0000	6996.0000	(28a)
External Wall 1	194.9100	31.0500	163.8600	0.1500	24.5790	110.0000	18024.6000	(29a)
main	78.6500		78.6500	0.1200	9.4380	9.0000	707.8500	(30)
over gf	14.6300		14.6300	0.1200	1.7556	9.0000	131.6700	(30)
Total net area of external elements Aum(A, m2)			381.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		80.8684			(33)
Internal Wall 1			278.0000			9.0000	2502.0000	(32c)
Internal Floor 1			78.6500			18.0000	1415.7000	(32d)
Internal Ceiling 1			78.6500			9.0000	707.8500	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		30485.6700	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							177.3144	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	41.5200	0.0590	2.4497
E16 Corner (normal)	24.8000	0.0350	0.8680

E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0660	-0.3168	
E12 Gable (insulation at ceiling level)	19.5400	0.0410	0.8011	
E10 Eaves (insulation at ceiling level)	32.8600	0.0640	2.1030	
E6 Intermediate floor within a dwelling	25.4100	0.0010	0.0254	
E24 Eaves (insulation at ceiling level - inverted)	10.8500	0.1500	1.6275	
E2 Other lintels (including other steel lintels)	23.7200	0.0310	0.7353	
E3 Sill	21.8600	0.0290	0.6339	
E4 Jamb	55.4000	0.0240	1.3296	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.2568 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 91.1252 (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	76.5855	76.3562	76.1314	75.0756	74.8780	73.9584	73.9584	73.7881	74.3127	74.8780	75.2776	75.6954	(38)
Heat transfer coeff	167.7107	167.4814	167.2566	166.2008	166.0032	165.0837	165.0837	164.9134	165.4379	166.0032	166.4029	166.8206	(39)
Average = Sum(39)m / 12 =												166.1998	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9755	0.9741	0.9728	0.9667	0.9655	0.9602	0.9602	0.9592	0.9622	0.9655	0.9679	0.9703	(40)
HLP (average)												0.9667	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9652 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.9357	72.8246	71.2055	68.1076	65.8215	63.2720	61.8228	63.4297	65.1911	67.9285	71.0929	73.6524	(42a)
Hot water usage for baths	31.9180	31.4440	30.7764	29.5456	28.6240	27.6021	27.0501	27.7130	28.4347	29.5282	30.7843	31.8101	(42b)
Hot water usage for other uses	44.9961	43.3599	41.7237	40.0874	38.4512	36.8150	36.8150	38.4512	40.0874	41.7237	43.3599	44.9961	(42c)
Average daily hot water use (litres/day)												138.6648	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8498	147.6284	143.7055	137.7407	132.8967	127.6890	125.6879	129.5939	133.7132	139.1803	145.2371	150.4586	(44)
Energy conte	238.9091	210.2209	220.8701	188.5601	178.9045	157.0086	152.0087	160.4643	164.8818	188.8664	206.9169	235.5818	(45)
Energy content (annual)										Total = Sum(45)m =		2303.1929	
Distribution loss (46)m = 0.15 x (45)m	35.8364	31.5331	33.1305	28.2840	26.8357	23.5513	22.8013	24.0696	24.7323	28.3300	31.0375	35.3373	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9720	(55)
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(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	292.3035	258.4481	274.2645	240.2321	232.2989	208.6806	205.4031	213.8587	216.5538	242.2608	258.5889	288.9762	(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	292.3035	258.4481	274.2645	240.2321	232.2989	208.6806	205.4031	213.8587	216.5538	242.2608	258.5889	288.9762	(64)
										Total per year (kWh/year) = Sum(64)m =		2931.8689	(64)
12Total per year (kWh/year)												2932	(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	122.1528	108.4802	116.1548	104.0338	102.2013	93.5430	93.2584	96.0699	96.1608	105.5136	110.1375	121.0465	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	181.2340	200.6519	181.2340	187.2751	181.2340	187.2751	181.2340	181.2340	187.2751	181.2340	187.2751	181.2340	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.5129	347.0775	338.0949	318.9719	294.8325	272.1449	256.9882	253.4236	262.4063	281.5293	305.6686	328.3562	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	(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)	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	(71)
Water heating gains (Table 5)	164.1839	161.4289	156.1221	144.4914	137.3673	129.9208	125.3473	129.1262	133.5567	141.8193	152.9687	162.6969	(72)
Total internal gains	756.4080	776.6355	742.9281	718.2156	680.9110	656.8180	631.0468	631.2611	650.7153	672.0598	713.3897	739.7643	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	25.2100	10.6334	0.7200	0.7000	0.7700	93.6286	(74)
East	0.5600	19.6403	0.7200	0.7000	0.7700	3.8415	(76)
West	1.3800	19.6403	0.7200	0.7000	0.7700	9.4665	(80)

Solar gains	106.9366	204.9623	346.9172	550.9007	734.5131	782.7278	732.2209	585.8240	415.4227	243.8823	132.0964	88.9973	(83)
Total gains	863.3446	981.5978	1089.8454	1269.1163	1415.4241	1439.5459	1363.2676	1217.0850	1066.1380	915.9421	845.4861	828.7616	(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	50.4931	50.5623	50.6302	50.9519	51.0125	51.2967	51.2967	51.3496	51.1868	51.0125	50.8900	50.7626	
alpha	4.3662	4.3708	4.3753	4.3968	4.4008	4.4198	4.4198	4.4233	4.4125	4.4008	4.3927	4.3842	
util living area	0.9959	0.9923	0.9831	0.9468	0.8484	0.6727	0.5169	0.5919	0.8420	0.9702	0.9923	0.9966	(86)
Living	19.3610	19.5451	19.8561	20.3150	20.7097	20.9253	20.9816	20.9676	20.7934	20.2908	19.7530	19.3288	
Non living	18.1627	18.3985	18.7952	19.3731	19.8396	20.0642	20.1082	20.1011	19.9442	19.3517	18.6688	18.1243	
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	20.1616	19.5451	19.8561	20.3150	20.7097	20.9253	20.9816	20.9676	20.7934	20.2908	19.7530	19.5625	(87)
Th 2	20.1038	20.1050	20.1060	20.1112	20.1122	20.1166	20.1166	20.1175	20.1149	20.1122	20.1102	20.1082	(88)
util rest of house	0.9950	0.9904	0.9788	0.9326	0.8093	0.5991	0.4202	0.4914	0.7861	0.9597	0.9901	0.9958	(89)
MIT 2	19.3300	18.3985	18.7952	19.3731	19.8396	20.0642	20.1082	20.1011	19.9442	19.3517	18.6688	18.4818	(90)
Living area fraction										fLA = Living area / (4) =		0.1302	(91)
MIT	19.4382	18.5477	18.9333	19.4957	19.9528	20.1763	20.2219	20.2139	20.0548	19.4740	18.8099	18.6225	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4382	18.5477	18.9333	19.4957	19.9528	20.1763	20.2219	20.2139	20.0548	19.4740	18.8099	18.6225	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9940	0.9857	0.9709	0.9202	0.8013	0.6044	0.4321	0.5029	0.7817	0.9494	0.9854	0.9939	(94)
Useful gains	858.1962	967.5246	1058.1613	1167.8618	1134.1979	870.0754	589.0292	612.1051	833.3646	869.5821	833.1260	823.6663	(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	2538.8399	2285.7431	2079.5552	1761.0087	1369.9984	920.5494	597.9198	628.9674	985.1421	1473.1092	1948.5624	2405.9713	(97)
Space heating kWh	1250.3989	885.8428	759.9170	427.0657	175.4356	0.0000	0.0000	0.0000	0.0000	449.0241	803.1142	1177.2349	(98a)
Space heating requirement - total per year (kWh/year)												5928.0334	
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	1250.3989	885.8428	759.9170	427.0657	175.4356	0.0000	0.0000	0.0000	0.0000	449.0241	803.1142	1177.2349	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5928.0334	
Space heating per m2											(98c) / (4) =	34.4793	(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 %) 249.6161 (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	1250.3989	885.8428	759.9170	427.0657	175.4356	0.0000	0.0000	0.0000	0.0000	449.0241	803.1142	1177.2349	(98)
Space heating efficiency (main heating system 1)	249.6161	249.6161	249.6161	249.6161	249.6161	0.0000	0.0000	0.0000	0.0000	249.6161	249.6161	249.6161	(210)
Space heating fuel (main heating system)	500.9288	354.8821	304.4343	171.0890	70.2822	0.0000	0.0000	0.0000	0.0000	179.8859	321.7398	471.6182	(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	292.3035	258.4481	274.2645	240.2321	232.2989	208.6806	205.4031	213.8587	216.5538	242.2608	258.5889	288.9762	(64)
Efficiency of water heater												171.5721	(216)
(217)m	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	171.5721	(217)
Fuel for water heating, kWh/month	170.3678	150.6353	159.8538	140.0182	135.3943	121.6285	119.7182	124.6465	126.2174	141.2006	150.7173	168.4284	(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	45.9061	36.8276	33.1591	24.2938	18.7652	15.3314	17.1183	22.2510	28.9018	37.9207	42.8314	47.1819	(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												2374.8604	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												171.5721	
Water heating fuel used												1708.8262	(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)	370.4883	(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	4454.1749	(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	2374.8604	0.1552	368.6749	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1708.8262	0.1410	240.8824	(264)
Space and water heating			609.5573	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	370.4883	0.1443	53.4729	(268)
Total CO2, kg/year			663.0302	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8600	(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	2374.8604	1.5747	3739.7387	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1708.8262	1.5212	2599.5273	(278)
Space and water heating			6339.2660	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	370.4883	1.5338	568.2673	(282)
Total Primary energy kWh/year			6907.5333	(286)
Dwelling Primary energy Rate (DPER)			40.1800	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		93.2800 (1b)	x	2.4000 (2b)	=	223.8720	(1b) - (3b)
First floor		78.6500 (1c)	x	2.6000 (2c)	=	204.4900	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	171.9300						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	428.3620	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.0934	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3434	(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) =	0.2919	(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	0.3721	0.3648	0.3575	0.3211	0.3138	0.2773	0.2773	0.2700	0.2919	0.3138	0.3284	0.3429	(22b)
Effective ac	0.5692	0.5666	0.5639	0.5515	0.5492	0.5384	0.5384	0.5364	0.5426	0.5492	0.5539	0.5588	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			3.9000	1.0000	3.9000			(26)
TER Opening Type (Uw = 1.20)			27.1500	1.1450	31.0878			(27)
Heatloss Floor 1			93.2800	0.1300	12.1264			(28a)
External Wall 1	194.9100	31.0500	163.8600	0.1800	29.4948			(29a)
main	78.6500		78.6500	0.1100	8.6515			(30)
over gf	14.6300		14.6300	0.1100	1.6093			(30)
Total net area of external elements Aum(A, m2)			381.4700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		86.8698			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 177.3144 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	41.5200	0.1600	6.6432
E16 Corner (normal)	24.8000	0.0900	2.2320
E17 Corner (inverted - internal area greater than external area)	4.8000	-0.0900	-0.4320
E12 Gable (insulation at ceiling level)	19.5400	0.0600	1.1724
E10 Eaves (insulation at ceiling level)	32.8600	0.0600	1.9716
E6 Intermediate floor within a dwelling	25.4100	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	10.8500	0.2400	2.6040
E2 Other lintels (including other steel lintels)	23.7200	0.0500	1.1860
E3 Sill	21.8600	0.0500	1.0930
E4 Jamb	55.4000	0.0500	2.7700

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.2402 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 106.1100 (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	80.4679	80.0878	79.7152	77.9653	77.6379	76.1138	76.1138	75.8316	76.7009	77.6379	78.3003	78.9927	(38)
Heat transfer coeff	186.5779	186.1978	185.8252	184.0753	183.7479	182.2238	182.2238	181.9416	182.8109	183.7479	184.4102	185.1027	(39)
Average = Sum(39)m / 12 =												184.0738	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0852	1.0830	1.0808	1.0706	1.0687	1.0599	1.0599	1.0582	1.0633	1.0687	1.0726	1.0766	(40)
HLP (average)												1.0706	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9652 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.9357	72.8246	71.2055	68.1076	65.8215	63.2720	61.8228	63.4297	65.1911	67.9285	71.0929	73.6524	(42a)
Hot water usage for baths	31.9180	31.4440	30.7764	29.5456	28.6240	27.6021	27.0501	27.7130	28.4347	29.5282	30.7843	31.8101	(42b)
Hot water usage for other uses	44.9961	43.3599	41.7237	40.0874	38.4512	36.8150	36.8150	38.4512	40.0874	41.7237	43.3599	44.9961	(42c)
Average daily hot water use (litres/day)												138.6648	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.8498	147.6284	143.7055	137.7407	132.8967	127.6890	125.6879	129.5939	133.7132	139.1803	145.2371	150.4586	(44)
Energy conte	238.9091	210.2209	220.8701	188.5601	178.9045	157.0086	152.0087	160.4643	164.8818	188.8664	206.9169	235.5818	(45)
Energy content (annual)										Total = Sum(45)m =		2303.1929	
Distribution loss (46)m = 0.15 x (45)m	35.8364	31.5331	33.1305	28.2840	26.8357	23.5513	22.8013	24.0696	24.7323	28.3300	31.0375	35.3373	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0208	(55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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	293.8159	259.8141	275.7769	241.6957	233.8113	210.1442	206.9154	215.3711	218.0174	243.7732	260.0525	290.4886	(62)
WWHRS	-33.8003	-29.8933	-31.3025	-25.9197	-24.1562	-20.6707	-19.3755	-20.6039	-21.3867	-25.2125	-28.5627	-33.1744	(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	260.0156	229.9208	244.4744	215.7760	209.6550	189.4735	187.5400	194.7672	196.6307	218.5606	231.4897	257.3142	(64)
										Total per year (kWh/year) = Sum(64)m =		2635.6178	(64)
12Total per year (kWh/year)												2636	(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	123.3627	109.5730	117.3647	105.2047	103.4112	94.7138	94.4683	97.2798	97.3317	106.7235	111.3083	122.2564	(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	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	148.2575	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	181.2340	200.6519	181.2340	187.2751	181.2340	187.2751	181.2340	181.2340	187.2751	181.2340	187.2751	181.2340	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.5129	347.0775	338.0949	318.9719	294.8325	272.1449	256.9882	253.4236	262.4063	281.5293	305.6686	328.3562	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	37.8258	(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)	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	-118.6060	(71)
Water heating gains (Table 5)	165.8101	163.0551	157.7483	146.1177	138.9935	131.5470	126.9735	130.7524	135.1829	143.4456	154.5949	164.3231	(72)
Total internal gains	761.0343	781.2618	747.5544	722.8419	685.5372	658.4443	632.6730	632.8873	652.3415	676.6861	718.0159	744.3905	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	25.2100	10.6334	0.6300	0.7000	0.7700	81.9250	(74)
East	0.5600	19.6403	0.6300	0.7000	0.7700	3.3613	(76)
West	1.3800	19.6403	0.6300	0.7000	0.7700	8.2832	(80)

Solar gains	93.5695	179.3420	303.5526	482.0381	642.6990	684.8869	640.6932	512.5960	363.4949	213.3970	115.5844	77.8726	(83)
Total gains	854.6038	960.6038	1051.1069	1204.8800	1328.2362	1343.3311	1273.3662	1145.4832	1015.8364	890.0831	833.6003	822.2631	(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	45.3872	45.4798	45.5710	46.0042	46.0862	46.4717	46.4717	46.5437	46.3224	46.0862	45.9207	45.7489	
alpha	4.0258	4.0320	4.0381	4.0669	4.0724	4.0981	4.0981	4.1029	4.0882	4.0724	4.0614	4.0499	
util living area	0.9960	0.9931	0.9863	0.9605	0.8894	0.7433	0.5910	0.6626	0.8797	0.9757	0.9929	0.9966	(86)
MIT	19.1381	19.3187	19.6356	20.1172	20.5645	20.8613	20.9592	20.9355	20.6960	20.1395	19.5687	19.1132	(87)
Th 2	20.0129	20.0148	20.0165	20.0249	20.0264	20.0337	20.0337	20.0351	20.0309	20.0264	20.0233	20.0200	(88)
util rest of house	0.9950	0.9913	0.9825	0.9489	0.8552	0.6667	0.4774	0.5501	0.8287	0.9666	0.9908	0.9958	(89)
MIT 2	17.8172	18.0492	18.4546	19.0673	19.6090	19.9334	20.0149	20.0019	19.7739	19.1031	18.3754	17.7899	(90)
Living area fraction									fLA = Living area / (4) =			0.1302	(91)
MIT	17.9891	18.2145	18.6083	19.2040	19.7334	20.0542	20.1378	20.1234	19.8939	19.2380	18.5308	17.9621	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9891	18.2145	18.6083	19.2040	19.7334	20.0542	20.1378	20.1234	19.8939	19.2380	18.5308	17.9621	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9919	0.9865	0.9748	0.9360	0.8428	0.6685	0.4904	0.5613	0.8199	0.9560	0.9859	0.9930	(94)
Useful gains	847.6460	947.6268	1024.6225	1127.7096	1119.4353	898.0361	624.4830	643.0069	832.8671	850.9237	821.8504	816.5310	(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	2554.0835	2479.1292	2250.0304	1896.7064	1476.1218	993.8801	644.6707	677.4478	1059.1879	1587.2120	2107.9488	2547.4042	(97)
Space heating kWh	1269.5895	1029.1696	911.7034	553.6777	265.3748	0.0000	0.0000	0.0000	0.0000	547.7985	925.9908	1287.7696	(98a)
Space heating requirement - total per year (kWh/year)												6791.0739	
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	1269.5895	1029.1696	911.7034	553.6777	265.3748	0.0000	0.0000	0.0000	0.0000	547.7985	925.9908	1287.7696	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6791.0739	
Space heating per m2										(98c) / (4) =		39.4991	(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	1269.5895	1029.1696	911.7034	553.6777	265.3748	0.0000	0.0000	0.0000	0.0000	547.7985	925.9908	1287.7696	(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)	1375.5032	1115.0267	987.7610	599.8675	287.5133	0.0000	0.0000	0.0000	0.0000	593.4978	1003.2403	1395.2000	(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	260.0156	229.9208	244.4744	215.7760	209.6550	189.4735	187.5400	194.7672	196.6307	218.5606	231.4897	257.3142	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.1296	87.0081	86.7316	86.0776	84.5894	79.8000	79.8000	79.8000	79.8000	86.0328	86.8412	87.1629	(217)
Fuel for water heating, kWh/month	298.4241	264.2523	281.8745	250.6761	247.8501	237.4355	235.0125	244.0692	246.4044	254.0434	266.5666	295.2108	(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	37.6568	30.2097	27.2005	19.9283	15.3932	12.5763	14.0422	18.2525	23.7082	31.1065	35.1347	38.7034	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-77.8912	-105.3372	-145.2446	-156.3343	-162.7787	-149.7227	-147.6626	-142.0500	-131.5632	-116.8531	-83.9355	-67.8602	(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	-58.6891	-121.4307	-237.7995	-352.2310	-461.2033	-461.9452	-456.6881	-388.8793	-287.8782	-172.1914	-77.8453	-46.5832	(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	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	7357.6099	(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	3121.8195	(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)	303.9123	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4610.5977	(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	6258.7439	(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	7357.6099	0.2100	1545.0981	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3121.8195	0.2100	655.5821	(264)
Space and water heating			2200.6802	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	303.9123	0.1443	43.8639	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1487.2333	0.1355	-201.5603	
PV Unit electricity exported	-3123.3644	0.1263	-394.4854	
Total			-596.0457	(269)
Total CO2, kg/year			1660.4276	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.6600	(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	7357.6099	1.1300	8314.0992	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3121.8195	1.1300	3527.6560	(278)
Space and water heating			11841.7552	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	303.9123	1.5338	466.1508	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1487.2333	1.5009	-2232.2435	
PV Unit electricity exported	-3123.3644	0.4636	-1448.0872	
Total			-3680.3307	(283)
Total Primary energy kWh/year			8757.6760	(286)
Target Primary Energy Rate (TPER)			50.9400	(287)

Full SAP Calculation Printout

elmhurst energy

Property Reference	Plot 9	Assessment Date	27/09/2024
Property Reference (cont.)	00001	Dwelling Type	
Address	Plot 9 Eastmere Stables , Eastergate Lane, Eastergate, West Sussex, PO20 3SJ		

SAP Rating	81 B	DER	4.14	TER	9.99
Environment	96 A	% DER < TER			58.56
CO2 Emissions (tonnes)	0.47	DFEE	36.11	TFEE	40.61
Compliance Check	See BREL	% DFEE < TFEE			11.09
Assessor's Name	17.18	DPER	43.20	TPER	52.16

Assessor Name	Mr. Neil Rothon	Accreditation	L759-0001
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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.8100	(1b)	x 2.4000	(2b) =	155.5440	(1b) - (3b)
First floor	64.8100	(1c)	x 2.6000	(2c) =	168.5060	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	129.6200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		324.0500	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1234	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2734	(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) =	0.2529	(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	0.3225	0.3162	0.3098	0.2782	0.2719	0.2403	0.2403	0.2340	0.2529	0.2719	0.2845	0.2972	(22b)
Effective ac	0.5520	0.5500	0.5480	0.5387	0.5370	0.5289	0.5289	0.5274	0.5320	0.5370	0.5405	0.5442	(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	
Front door			1.9500	1.2000	2.3400			(26)
Windows (Uw = 1.20)			24.6600	1.1450	28.2366			(27)
rl			0.7200	1.2357	0.8897			(27a)
rl			0.7200	1.2357	0.8897			(27a)
Heatloss Floor 1			64.8100	0.1000	6.4810	75.0000	4860.7500	(28a)
External Wall 1	146.8200	22.4100	124.4100	0.1500	18.6615	110.0000	13685.1000	(29a)
dormers	6.8000	4.2000	2.6000	0.1800	0.4680	9.0000	23.4000	(29a)
External Roof 1	56.1500		56.1500	0.1200	6.7380	9.0000	505.3500	(30)
sloping	19.8100	1.4400	18.3700	0.1600	2.9392	9.0000	165.3300	(30)
Total net area of external elements Aum(A, m2)			294.3900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		67.6438			(33)
Internal Wall 1			215.8000			9.0000	1942.2000	(32c)
Internal Floor 1			64.8100			18.0000	1166.5800	(32d)
Internal Ceiling 1			64.8100			9.0000	583.2900	(32e)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		22932.0000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							176.9171	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	34.2600	0.0590	2.0213	
E16 Corner (normal)	17.0000	0.0350	0.5950	
E17 Corner (inverted - internal area greater than external area)	3.4200	-0.0660	-0.2257	
E13 Gable (insulation at rafter level)	7.2000	0.0420	0.3024	
E11 Eaves (insulation at rafter level)	13.7600	0.0220	0.3027	
E12 Gable (insulation at ceiling level)	12.4000	0.0410	0.5084	
E6 Intermediate floor within a dwelling	34.2600	0.0010	0.0343	
E16 Corner (normal)	7.5600	0.1800	1.3608	
R4 Ridge (vaulted ceiling)	2.7000	0.1200	0.3240	
R9 Roof to wall (flat ceiling)	9.0000	0.3200	2.8800	
R7 Flat ceiling (inverted)	5.4000	0.1200	0.6480	
E3 Sill	18.5900	0.0000	0.0000	
R11 Upstands or kerbs of rooflights	6.8000	0.2400	1.6320	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.3832 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 78.0270 (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	59.0288	58.8129	58.6012	57.6071	57.4211	56.5553	56.5553	56.3950	56.8888	57.4211	57.7974	58.1908	(38)
Heat transfer coeff	137.0558	136.8399	136.6282	135.6341	135.4481	134.5823	134.5823	134.4220	134.9158	135.4481	135.8244	136.2178	(39)
Average = Sum(39)m / 12 =												135.6332	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0574	1.0557	1.0541	1.0464	1.0450	1.0383	1.0383	1.0370	1.0409	1.0450	1.0479	1.0509	(40)
HLP (average)												1.0464	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8940 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.7427	71.6495	70.0565	67.0086	64.7594	62.2510	60.8253	62.4062	64.1392	66.8324	69.9457	72.4640	(42a)
Hot water usage for baths	31.4049	30.9385	30.2817	29.0707	28.1639	27.1584	26.6153	27.2675	27.9776	29.0536	30.2895	31.2988	(42b)
Hot water usage for other uses	44.2674	42.6577	41.0480	39.4383	37.8285	36.2188	36.2188	37.8285	39.4383	41.0480	42.6577	44.2674	(42c)
Average daily hot water use (litres/day)												136.4268	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.4151	145.2457	141.3862	135.5176	130.7518	125.6283	123.6594	127.5023	131.5551	136.9339	142.8930	148.0302	(44)
Energy conte	235.0532	206.8280	217.3054	185.5168	176.0171	154.4746	149.5553	157.8744	162.2206	185.8181	203.5772	231.7795	(45)
Energy content (annual)										Total = Sum(45)m =		2266.0203	
Distribution loss (46)m = 0.15 x (45)m	35.2580	31.0242	32.5958	27.8275	26.4026	23.1712	22.4333	23.6812	24.3331	27.8727	30.5366	34.7669	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9720	(55)
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(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	288.4476	255.0552	270.6998	237.1888	229.4115	206.1466	202.9497	211.2688	213.8926	239.2125	255.2492	285.1739	(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	288.4476	255.0552	270.6998	237.1888	229.4115	206.1466	202.9497	211.2688	213.8926	239.2125	255.2492	285.1739	(64)
										Total per year (kWh/year) = Sum(64)m =		2894.6963	(64)
12Total per year (kWh/year)												2895	(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	120.8707	107.3521	114.9696	103.0220	101.2412	92.7004	92.4427	95.2088	95.2759	104.5000	109.0270	119.7822	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	150.7234	166.8723	150.7234	155.7475	150.7234	155.7475	150.7234	150.7234	155.7475	150.7234	155.7475	150.7234	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.2620	300.3466	292.5734	276.0251	255.1359	235.5030	222.3871	219.3024	227.0756	243.6239	264.5131	284.1460	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	37.4700	(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)	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	-115.7599	(71)
Water heating gains (Table 5)	162.4606	159.7501	154.5290	143.0860	136.0769	128.7506	124.2509	127.9688	132.3277	140.4570	151.4264	160.9976	(72)
Total internal gains	676.8559	693.3790	664.2357	641.2686	608.3462	586.4111	563.7713	564.4045	581.5608	601.2143	638.0970	662.2769	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	1.4400	26.0000	0.4000	0.7000	1.0000	9.4349	(82)
North	1.5700	10.6334	0.7200	0.7000	0.7700	5.8309	(74)

East			8.8100		19.6403		0.7200		0.7000		0.7700		60.4348 (76)
West			14.2800		19.6403		0.7200		0.7000		0.7700		97.9579 (80)
Solar gains	173.6584	340.5883	564.0496	829.0567	1022.7015	1050.0899	998.4098	852.9917	657.9718	404.8772	216.6652	142.7358	(83)
Total gains	850.5144	1033.9673	1228.2853	1470.3253	1631.0477	1636.5010	1562.1811	1417.3962	1239.5325	1006.0915	854.7622	805.0127	(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	46.4774	46.5508	46.6229	46.9646	47.0291	47.3316	47.3316	47.3881	47.2146	47.0291	46.8988	46.7634	
alpha	4.0985	4.1034	4.1082	4.1310	4.1353	4.1554	4.1554	4.1592	4.1476	4.1353	4.1266	4.1176	
util living area	0.9891	0.9757	0.9416	0.8467	0.6901	0.5084	0.3749	0.4283	0.6771	0.9136	0.9788	0.9912	(86)
Living	19.4080	19.6861	20.0925	20.5630	20.8521	20.9675	20.9927	20.9876	20.8988	20.4601	19.8412	19.3583	
Non living	18.1764	18.5292	19.0372	19.6038	19.9188	20.0308	20.0486	20.0470	19.9754	19.5003	18.7335	18.1167	
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	20.1856	19.6861	20.0925	20.5630	20.8521	20.9675	20.9927	20.9876	20.8988	20.4601	19.8412	19.5879	(87)
Th 2	20.0358	20.0372	20.0385	20.0448	20.0460	20.0516	20.0516	20.0526	20.0494	20.0460	20.0436	20.0411	(88)
util rest of house	0.9865	0.9702	0.9287	0.8161	0.6380	0.4394	0.2960	0.3436	0.6054	0.8885	0.9731	0.9891	(89)
MIT 2	19.2945	18.5292	19.0372	19.6038	19.9188	20.0308	20.0486	20.0470	19.9754	19.5003	18.7335	18.4635	(90)
Living area fraction										fLA = Living area / (4) =		0.2119	(91)
MIT	19.4834	18.7744	19.2608	19.8071	20.1166	20.2293	20.2486	20.2464	20.1711	19.7037	18.9683	18.7018	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4834	18.7744	19.2608	19.8071	20.1166	20.2293	20.2486	20.2464	20.1711	19.7037	18.9683	18.7018	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9847	0.9606	0.9159	0.8076	0.6421	0.4526	0.3126	0.3613	0.6152	0.8776	0.9644	0.9851	(94)
Useful gains	837.5297	993.2361	1124.9330	1187.3868	1047.2360	740.7032	488.2909	512.0543	762.5561	882.9043	824.2911	793.0550	(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	2080.9710	1898.5659	1743.4907	1479.3754	1140.0151	757.6014	491.0437	517.0343	819.0883	1233.0796	1612.0030	1975.4033	(97)
Space heating kWh	925.1203	608.3817	460.2069	210.2318	69.0277	0.0000	0.0000	0.0000	0.0000	260.5305	567.1526	879.6671	(98a)
Space heating requirement - total per year (kWh/year)												3980.3186	
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	925.1203	608.3817	460.2069	210.2318	69.0277	0.0000	0.0000	0.0000	0.0000	260.5305	567.1526	879.6671	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3980.3186	
Space heating per m2											(98c) / (4) =	30.7076	(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 %)												242.0371	(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	925.1203	608.3817	460.2069	210.2318	69.0277	0.0000	0.0000	0.0000	0.0000	260.5305	567.1526	879.6671	(98)
Space heating efficiency (main heating system 1)	242.0371	242.0371	242.0371	242.0371	242.0371	0.0000	0.0000	0.0000	0.0000	242.0371	242.0371	242.0371	(210)
Space heating fuel (main heating system)	382.2225	251.3588	190.1390	86.8593	28.5194	0.0000	0.0000	0.0000	0.0000	107.6407	234.3246	363.4430	(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	288.4476	255.0552	270.6998	237.1888	229.4115	206.1466	202.9497	211.2688	213.8926	239.2125	255.2492	285.1739	(64)
Efficiency of water heater												172.3171	(216)
(217)m	172.3171	172.3171	172.3171	172.3171	172.3171	172.3171	172.3171	172.3171	172.3171	172.3171	172.3171	172.3171	(217)
Fuel for water heating, kWh/month	167.3935	148.0150	157.0940	137.6467	133.1333	119.6321	117.7769	122.6047	124.1273	138.8211	148.1276	165.4936	(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	36.1792	29.0243	26.1331	19.1463	14.7891	12.0828	13.4911	17.5363	22.7779	29.8858	33.7560	37.1847	(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												1644.5073	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	172.3171	
Water heating fuel used	1679.8657	(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)	291.9865	(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	3616.3596	(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	1644.5073	0.1563	257.0597	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1679.8657	0.1410	236.7867	(264)
Space and water heating			493.8465	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	291.9865	0.1443	42.1427	(268)
Total CO2, kg/year			535.9892	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1400	(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	1644.5073	1.5787	2596.1080	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1679.8657	1.5212	2555.4219	(278)
Space and water heating			5151.5299	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	291.9865	1.5338	447.8587	(282)
Total Primary energy kWh/year			5599.3886	(286)
Dwelling Primary energy Rate (DPER)			43.2000	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	64.8100	(1b)	x 2.4000	(2b) =	155.5440	(1b) - (3b)
First floor	64.8100	(1c)	x 2.6000	(2c) =	168.5060	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	129.6200					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		324.0500	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1234	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3734	(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) =	0.3454	(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	0.4404	0.4318	0.4232	0.3800	0.3713	0.3282	0.3282	0.3195	0.3454	0.3713	0.3886	0.4059	(22b)
Effective ac	0.5970	0.5932	0.5895	0.5722	0.5689	0.5538	0.5538	0.5510	0.5597	0.5689	0.5755	0.5824	(25)

---

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.9500	1.0000	1.9500			(26)
TER Opening Type (Uw = 1.20)			24.6600	1.1450	28.2366			(27)
rl			0.7200	2.0221	1.4559			(27a)
rl			0.7200	2.0221	1.4559			(27a)
Heatloss Floor 1			64.8100	0.1300	8.4253			(28a)
External Wall 1	146.8200	22.4100	124.4100	0.1800	22.3938			(29a)
dormers	6.8000	4.2000	2.6000	0.1800	0.4680			(29a)
External Roof 1	56.1500		56.1500	0.1100	6.1765			(30)
sloping	19.8100	1.4400	18.3700	0.1100	2.0207			(30)
Total net area of external elements Aum(A, m2)			294.3900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	72.5827			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 176.9171 (35)

List of Thermal Bridges

K1	Element	Length	Psi-value	Total
E5	Ground floor (normal)	34.2600	0.1600	5.4816
E16	Corner (normal)	17.0000	0.0900	1.5300
E17	Corner (inverted - internal area greater than external area)	3.4200	-0.0900	-0.3078
E13	Gable (insulation at rafter level)	7.2000	0.0800	0.5760
E11	Eaves (insulation at rafter level)	13.7600	0.0400	0.5504
E12	Gable (insulation at ceiling level)	12.4000	0.0600	0.7440
E6	Intermediate floor within a dwelling	34.2600	0.0000	0.0000
E16	Corner (normal)	7.5600	0.0900	0.6804
R4	Ridge (vaulted ceiling)	2.7000	0.0800	0.2160
R9	Roof to wall (flat ceiling)	9.0000	0.0400	0.3600
R7	Flat ceiling (inverted)	5.4000	0.0400	0.2160
E3	Sill	18.5900	0.0500	0.9295
R11	Upstands or kerbs of rooflights	6.8000	0.0800	0.5440

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.5201 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 84.1028 (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	63.8396	63.4369	63.0421	61.1880	60.8411	59.2261	59.2261	58.9271	59.8482	60.8411	61.5428	62.2765	(38)
Heat transfer coeff	147.9424	147.5397	147.1449	145.2908	144.9439	143.3289	143.3289	143.0299	143.9510	144.9439	145.6457	146.3793	(39)

Average = Sum(39)m / 12 = 145.2891

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1414	1.1382	1.1352	1.1209	1.1182	1.1058	1.1058	1.1035	1.1106	1.1182	1.1236	1.1293	(40)
HLP (average)												1.1209	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8940 (42)

Hot water usage for mixer showers

72.7427	71.6495	70.0565	67.0086	64.7594	62.2510	60.8253	62.4062	64.1392	66.8324	69.9457	72.4640	(42a)

Hot water usage for baths

31.4049	30.9385	30.2817	29.0707	28.1639	27.1584	26.6153	27.2675	27.9776	29.0536	30.2895	31.2988	(42b)

Hot water usage for other uses

44.2674	42.6577	41.0480	39.4383	37.8285	36.2188	36.2188	37.8285	39.4383	41.0480	42.6577	44.2674	(42c)

Average daily hot water use (litres/day) 136.4268 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	148.4151	145.2457	141.3862	135.5176	130.7518	125.6283	123.6594	127.5023	131.5551	136.9339	142.8930	148.0302	(44)
Energy conte	235.0532	206.8280	217.3054	185.5168	176.0171	154.4746	149.5553	157.8744	162.2206	185.8181	203.5772	231.7795	(45)

Energy content (annual) Total = Sum(45)m = 2266.0203

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

35.2580	31.0242	32.5958	27.8275	26.4026	23.1712	22.4333	23.6812	24.3331	27.8727	30.5366	34.7669	(46)

Water storage loss:

Store volume 250.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.8903 (48)

Temperature factor from Table 2b 0.5400 (49)

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

Total storage loss

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

If cylinder contains dedicated solar storage

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

289.9600	256.4212	272.2122	238.6525	230.9239	207.6102	204.4621	212.7812	215.3562	240.7249	256.7128	286.6863	(62)
-33.2549	-29.4109	-30.7974	-25.5015	-23.7665	-20.3371	-19.0628	-20.2714	-21.0416	-24.8057	-28.1018	-32.6391	(63a)
-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)
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)
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

256.7051	227.0103	241.4148	213.1510	207.1574	187.2731	185.3993	192.5098	194.3146	215.9192	228.6110	254.0472	(64)

Total per year (kWh/year) = Sum(64)m = 2603.5127 (64)

12Total per year (kWh/year) 2604 (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

122.0806	108.4449	116.1795	104.1928	102.4511	93.8713	93.6526	96.4187	96.4468	105.7099	110.1979	120.9921	(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	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	144.6999	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	150.7234	166.8723	150.7234	155.7475	150.7234	155.7475	150.7234	150.7234	155.7475	150.7234	155.7475	150.7234	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
297.2620 300.3466 292.5734 276.0251 255.1359 235.5030 222.3871 219.3024 227.0756 243.6239 264.5131 284.1460 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
37.4700 37.4700 37.4700 37.4700 37.4700 37.4700 37.4700 37.4700 37.4700 37.4700 37.4700 37.4700 (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)
-115.7599 -115.7599 -115.7599 -115.7599 -115.7599 -115.7599 -115.7599 -115.7599 -115.7599 -115.7599 -115.7599 -115.7599 (71)
Water heating gains (Table 5)
164.0868 161.3763 156.1552 144.7123 137.7031 130.3768 125.8771 129.5950 133.9539 142.0833 153.0527 162.6238 (72)
Total internal gains
681.4822 698.0052 668.8620 645.8949 612.9724 588.0373 565.3975 566.0307 583.1870 605.8405 642.7232 666.9031 (73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.5700	10.6334	0.6300	0.7000	0.7700	5.1020	(74)
East	8.8100	19.6403	0.6300	0.7000	0.7700	52.8804	(76)
West	14.2800	19.6403	0.6300	0.7000	0.7700	85.7131	(80)
East	1.4400	26.0000	0.6300	0.7000	1.0000	14.8599	(82)

Solar gains 158.5555 311.7316 517.9289 763.5270 943.6349 969.6319 921.6176 786.2482 604.9371 371.0326 197.9646 130.2282 (83)
Total gains 840.0377 1009.7368 1186.7909 1409.4218 1556.6073 1557.6691 1487.0151 1352.2790 1188.1241 976.8731 840.6878 797.1313 (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	43.0573	43.1748	43.2907	43.8431	43.9480	44.4432	44.4432	44.5361	44.2512	43.9480	43.7363	43.5171	
alpha	3.8705	3.8783	3.8860	3.9229	3.9299	3.9629	3.9629	3.9691	3.9501	3.9299	3.9158	3.9011	
util living area	0.9898	0.9788	0.9518	0.8743	0.7362	0.5569	0.4158	0.4718	0.7211	0.9275	0.9810	0.9916	(86)
MIT	19.2333	19.5040	19.9164	20.4306	20.7811	20.9458	20.9866	20.9783	20.8518	20.3482	19.7015	19.1963	(87)
Th 2	19.9672	19.9697	19.9722	19.9838	19.9860	19.9961	19.9961	19.9980	19.9922	19.9860	19.9816	19.9770	(88)
util rest of house	0.9874	0.9739	0.9405	0.8463	0.6834	0.4804	0.3247	0.3754	0.6474	0.9047	0.9757	0.9896	(89)
MIT 2	17.9087	18.2535	18.7725	19.4034	19.7952	19.9612	19.9906	19.9883	19.8822	19.3231	18.5152	17.8680	(90)
Living area fraction										fLA = Living area / (4) =		0.2119	(91)
MIT	18.1894	18.5185	19.0149	19.6211	20.0041	20.1698	20.2017	20.1981	20.0876	19.5403	18.7666	18.1495	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1894	18.5185	19.0149	19.6211	20.0041	20.1698	20.2017	20.1981	20.0876	19.5403	18.7666	18.1495	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9643	0.9270	0.8347	0.6844	0.4942	0.3437	0.3952	0.6550	0.8921	0.9668	0.9843	(94)
Useful gains	824.2606	973.6448	1100.1381	1176.3829	1065.3706	769.7591	511.1125	534.4447	778.2391	871.4932	812.8049	784.6207	(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	2054.8384	2009.2737	1841.5050	1557.6754	1203.6289	798.3191	516.2306	543.2464	861.9276	1295.8447	1699.1847	2041.9204	(97)
Space heating kWh	915.5499	695.9426	551.5769	274.5306	102.8641	0.0000	0.0000	0.0000	0.0000	315.7175	638.1934	935.4310	(98a)
Space heating requirement - total per year (kWh/year)												4429.8061	
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	915.5499	695.9426	551.5769	274.5306	102.8641	0.0000	0.0000	0.0000	0.0000	315.7175	638.1934	935.4310	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4429.8061	
Space heating per m2											(98c) / (4) =	34.1753	(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	915.5499	695.9426	551.5769	274.5306	102.8641	0.0000	0.0000	0.0000	0.0000	315.7175	638.1934	935.4310	(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)	991.9284	754.0007	597.5915	297.4329	111.4454	0.0000	0.0000	0.0000	0.0000	342.0558	691.4338	1013.4681	(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	256.7051	227.0103	241.4148	213.1510	207.1574	187.2731	185.3993	192.5098	194.3146	215.9192	228.6110	254.0472	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.6597	86.4032	85.8523	84.6284	82.5769	79.8000	79.8000	79.8000	79.8000	84.9106	86.2349	86.7113	(217)
Fuel for water heating, kWh/month	296.2219	262.7338	281.1979	251.8671	250.8661	234.6781	232.3300	241.2404	243.5020	254.2899	265.1025	292.9805	(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	31.3173	25.1239	22.6213	16.5733	12.8017	10.4591	11.6782	15.1797	19.7170	25.8697	29.2198	32.1877	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-57.5203	-79.5506	-112.1751	-123.6082	-131.1357	-121.5427	-119.9211	-114.1745	-103.8402	-89.6424	-62.6369	-49.9023	(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	-37.3743	-78.0054	-153.9601	-229.7378	-302.4007	-303.4380	-299.9756	-254.7098	-187.5834	-111.1829	-49.7667	-29.6118	(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	4799.3566	(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	3107.0099	(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)	252.7489	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3203.3966	(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	5041.7187	(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	4799.3566	0.2100	1007.8649	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3107.0099	0.2100	652.4721	(264)
Space and water heating			1660.3370	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	252.7489	0.1443	36.4795	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1165.6501	0.1350	-157.3886	
PV Unit electricity exported	-2037.7465	0.1261	-256.9207	
Total			-414.3093	(269)
Total CO2, kg/year			1294.4364	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9900	(273)

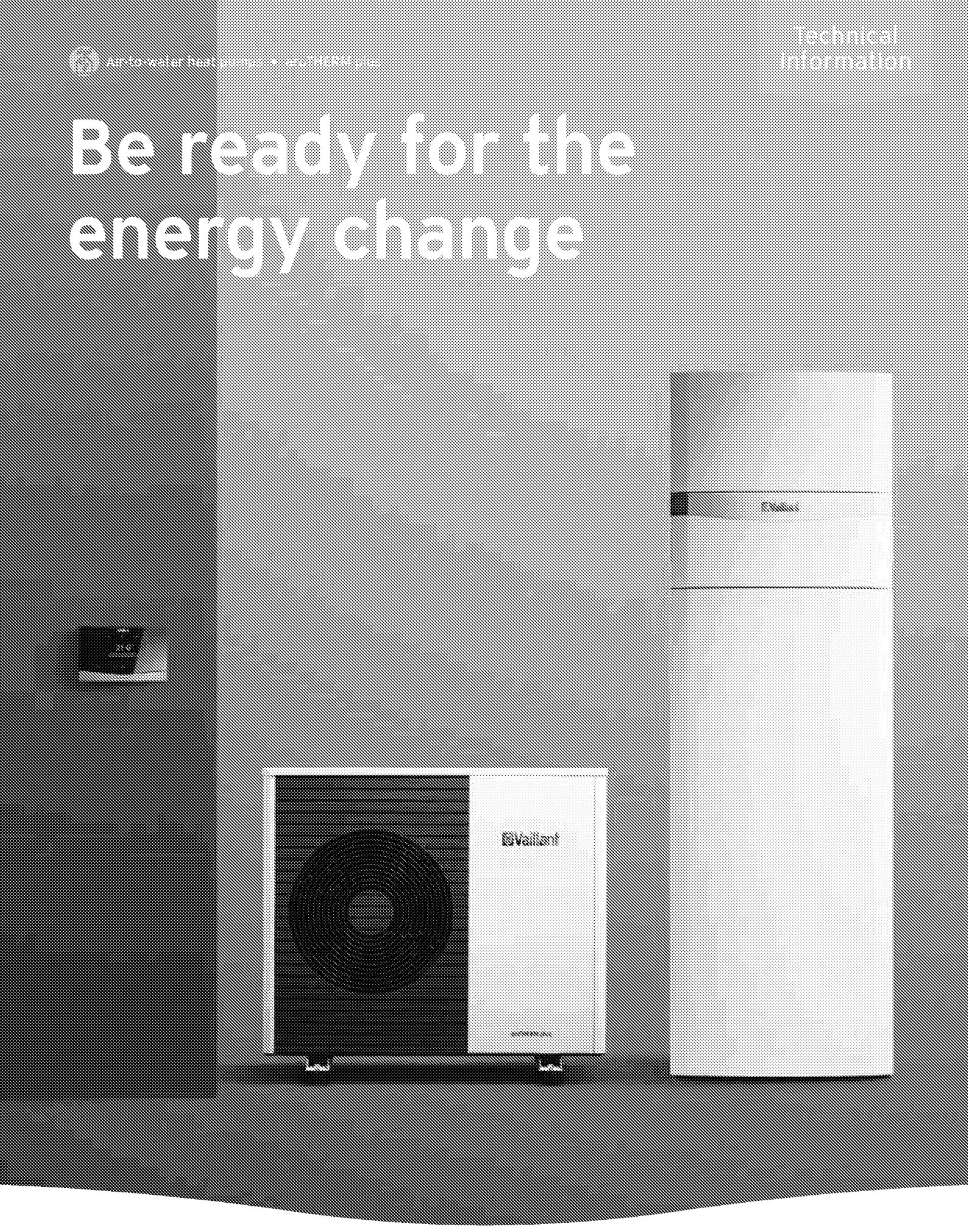
13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4799.3566	1.1300	5423.2730	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3107.0099	1.1300	3510.9212	(278)
Space and water heating			8934.1941	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	252.7489	1.5338	387.6746	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1165.6501	1.4990	-1747.3602	
PV Unit electricity exported	-2037.7465	0.4628	-943.0914	
Total			-2690.4516	(283)
Total Primary energy kWh/year			6761.5180	(286)
Target Primary Energy Rate (TPER)			52.1600	(287)

Appendix 4

Technical information

Be ready for the energy change



Vaillant Comfort for your home

Air-to-water heat pumps

A safe investment in the future

State-of-the-art heating technology with minimal environmental impact

Vaillant is continuously advancing the development of heat pump technology. The Vaillant research and development teams constantly strive to develop the most efficient and quiet heat pumps on the market, thoroughly testing them in our own testing centres for durability and performance. For example, we have climate and hail chambers where we can test for robustness and reliability in extreme conditions. Vaillant also manufactures only in Europe, so we can guarantee you and your customers receive the high quality expected from a Vaillant appliance.

Vaillant offers a great new model in our portfolio of air-to-water heat pumps with the introduction of the aroTHERM plus. This award-winning heat pump is the first in our range to use natural refrigerant R290. This refrigerant, commonly used in many household appliances, has a very low Global Warming Potential (GWP) that offers many advantages over refrigerants traditionally used in heat pumps.

The new aroTHERM plus heat pump has technical features for improved efficiency, as well as higher flow temperatures, so it's perfect for new and existing heating systems (including hybrid). It's also impressively quiet in operation and has been accredited by Quiet Mark*.

*Models 3.5, 5, 7 and 12kW

ARUN DISTRICT COUNCIL BN/128/24/RES

Always the right choice

Reliability and performance of the highest standards ensure peace of mind for your customers. It's so quiet, they won't even know it's on.

High performance

The aroTHERM plus heat pump has been designed to deliver the very best performance with low running costs, making it suitable for radiators as well as underfloor heating. With a flow temperature of up to 75°C, the aroTHERM plus can deliver more usable hot water with high hot water comfort levels and removes the need for direct electric immersion to sterilise the water, protecting from legionella.

Higher energy-efficiency

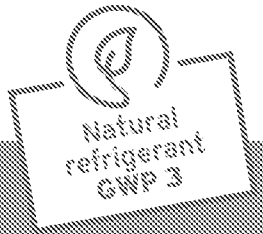
With a SCOP of up to 5.03, the aroTHERM plus is extremely energy efficient, enabling high energy savings against certain fossil fuels.
The aroTHERM plus can also be combined with photovoltaic systems and integrated into smart power grids (SG-ready), so your customers can enjoy the benefits of variable electricity tariffs.

Super quiet

With sound power as low as 54 dB for easier planning and siting, the aroTHERM plus is suitable for use in densely built-up terraced housing estates.

Natural refrigerant

Already fulfilling the next NZEB requirements, the aroTHERM plus uses monobloc technology with a hermetically sealed refrigerant circuit using the natural refrigerant, R290, to deliver the one of the lowest GWP of 3.



Why R290?

R290 is a natural refrigerant with a very low GWP of three. This offers the following advantages:

- future-proof, as not affected by the F-Gas Regulation
- higher flow temperature of up to 75°C
- higher hot water comfort and protection against legionella without electric auxiliary heating
- wider performance envelope with operating temperature ranging between -25°C and +46°C
- Already fulfilling the next NZEB requirements, the aroTHERM plus uses monobloc technology with a hermetically sealed refrigerant circuit using natural refrigerant R290 to deliver the one of the lowest GWP of 3
- Reduced refrigerant charge compared to R410A and R32

Natural refrigerants are already used in many areas of our daily lives, e.g. in refrigerators and heat pump tumble dryers.

Model calculation
R290 (aroTHERM plus)
0.5 kg R290 x 3 GWP = 1.5 kg CO_2

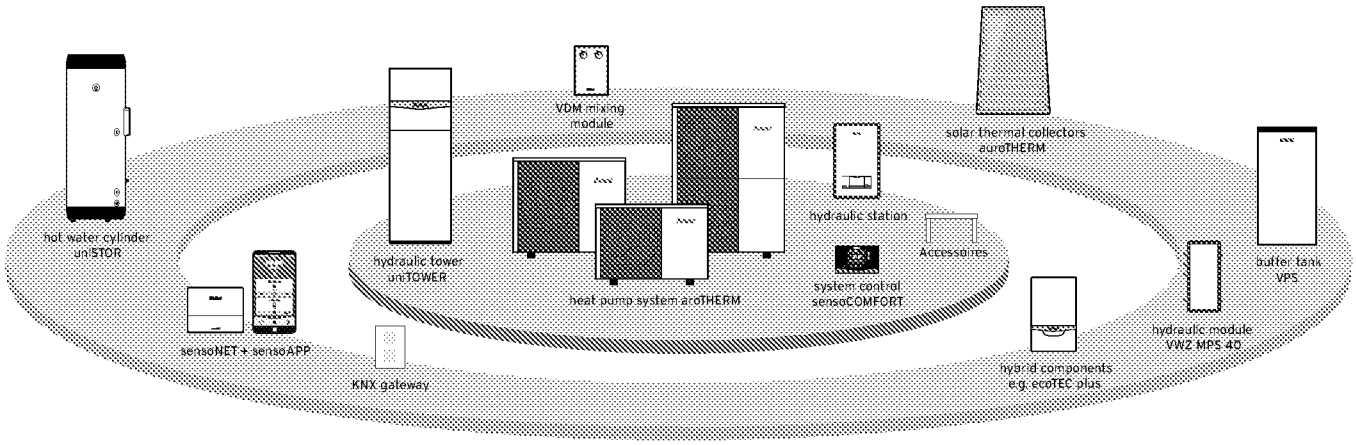
15 km journey by car

*Comparison of refrigerant GWP values:

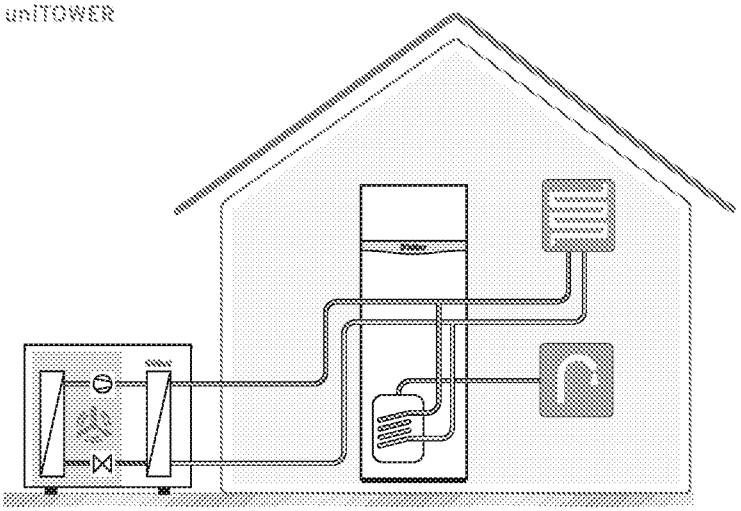
CO_2	1
R290	3
R32	675
R410A	2,088

Introducing the perfect partner

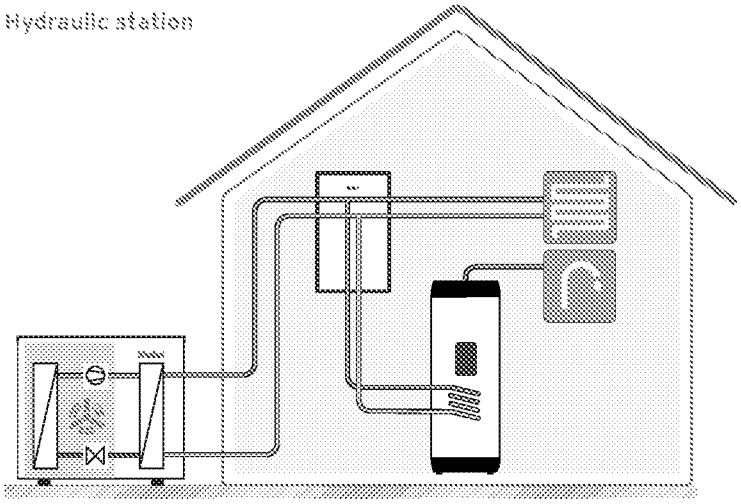
Your customers have widely differing wishes and needs. We offer the system components that enable you to fulfil them all – whether they wish to integrate photovoltaics, a solar-thermal system or smart home technology. All conveniently manageable with a single controller – the new sensoCOMFORT. This enables you to quickly commission the system and lets your customers change daily settings at the flick of a wrist.



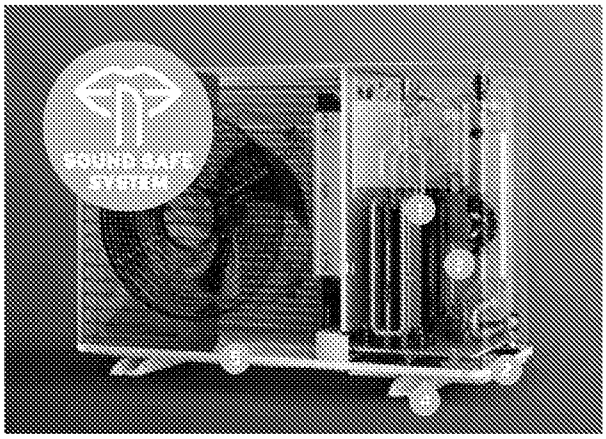
uniTOWER



Hydraulic station

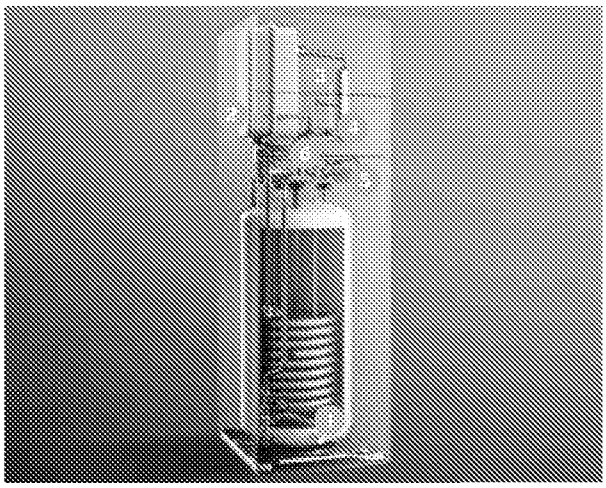


Features and benefits



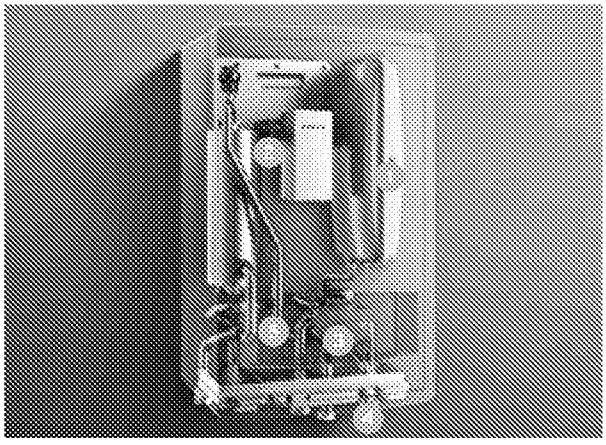
aroTHERM plus

- Hermetically sealed – no refrigerant certification required
- Floating floor design absorbs vibration and reduces noise
- Vortex sensor for accurate performance analysis
- Weatherproof material and paint make it an ideal choice for coastal areas
- Integrated tray and trace heater to ensure clear condensation run



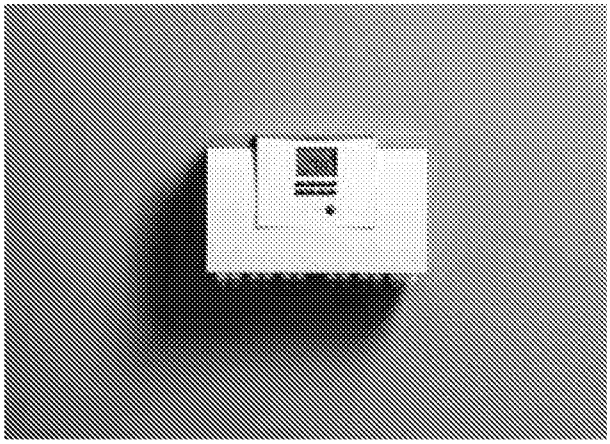
uniTOWER

- 190-litre storage cylinder capacity, corresponds to up to 380-litres of usable hot water output
- Hydraulic components already integrated, e.g. 15-litre expansion vessel
- System accessory options, ready for integration, e.g. heating zone packs, 18-litre buffer or system separation plate heat exchanger
- Modulating electric auxiliary heater with up to 6 kW
- 3-way diverter valve
- Electric wiring interface



Hydraulic module

- Hydraulic components already integrated, including 10-litre expansion vessel
- Modulating electric auxiliary heater with up to 6 kW
- 3-way diverter valve
- Continued use of existing hot water storage cylinders
- Electric wiring interface



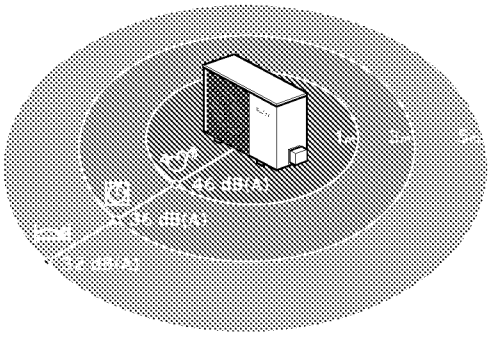
Heat pump interface

- Suitable for standard set-up and hybrid systems
- Heating system components can be placed to suit property layout
- Compatible with all Vaillant heat pump accessories including back-up heater, heat exchanger module and uniSTOR heat pump cylinders

SCOP and heating output

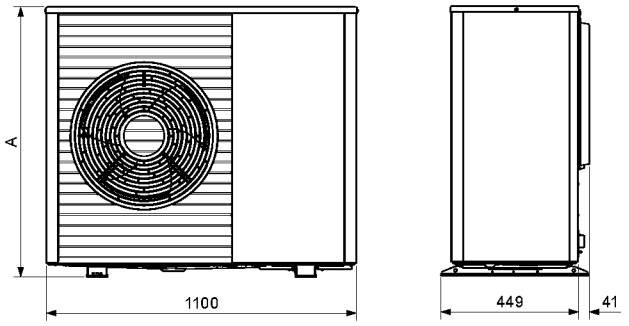
aroTHERM output		35°C flow		40°C flow		45°C flow		50°C flow		55°C flow	
		output	SCOP	output	SCOP	output	SCOP	output	SCOP	output	SCOP
3.5kW	-5°C	4.2	4.41	4.1	4.03	4	3.65	3.9	3.37	3.8	3.10
	-3°C	4.6		4.4		4.3		4.2		4	
	0°C	4.7		4.7		4.6		4.5		4.4	
	2°C	4.9		4.9		4.9		4.7		4.6	
5kW	-5°C	6.3	4.48	6	4.13	5.6	3.77	5.5	3.41	5.4	3.06
	-3°C	6.8		6.4		6.1		5.9		5.8	
	0°C	6.9		6.7		6.6		6.4		6.2	
	2°C	7.1		7		6.9		6.7		6.5	
7kW	-5°C	8.2	4.36	8.1	4.13	8	3.91	7.5	3.65	7	3.39
	-3°C	8.8		8.6		8.4		7.9		7.4	
	0°C	9.5		9.3		9.1		8.6		8.1	
	2°C	10		9.8		9.6		9		8.5	
10kW	-5°C	9.9	5.03	9.7	4.58	9.4	4.13	9.1	3.85	8.8	3.58
	-3°C	10.7		10.3		10		9.6		9.2	
	0°C	11.9		11.6		11.3		10.7		10.2	
	2°C	12.8		12.5		12.1		11.5		10.9	
12kW	-5°C	13.1	4.88	12.8	4.55	12.5	4.21	11.7	3.92	10.8	3.63
	-3°C	13.9		13.4		12.9		12.1		11.2	
	0°C	15.2		14.6		14.1		13.2		12.3	
	2°C	16		15.5		14.9		13.9		13	

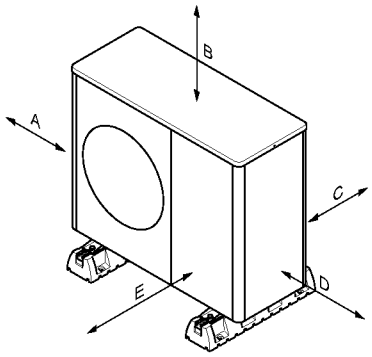
Sound power



Model	Sound Power Level A7/W55	Sound Pressure Level		
		1m distance	3m distance	5m distance
aroTHERM plus 3.5kW	54 dB	46 dB(A)	36 dB(A)	32 dB(A)
aroTHERM plus 5kW	54 dB	46 dB(A)	36 dB(A)	32 dB(A)
aroTHERM plus 7kW	55 dB	47 dB(A)	37 dB(A)	33 dB(A)
aroTHERM plus 10kW	60 dB	52 dB(A)	42 dB(A)	38 dB(A)
aroTHERM plus 12kW	60 dB	52 dB(A)	42 dB(A)	38 dB(A)

Dimensions and clearances



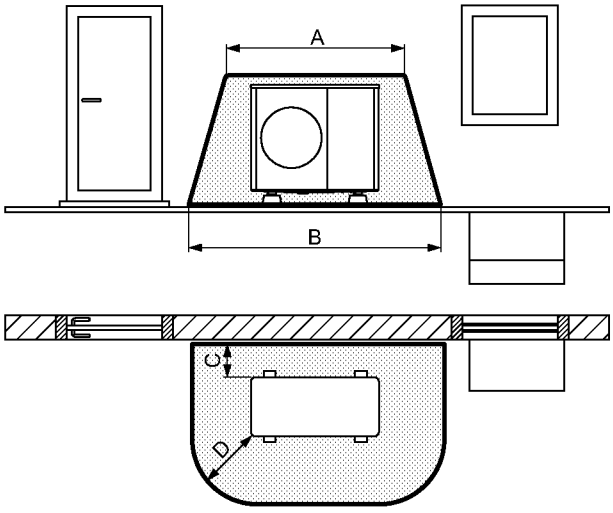


aroTHERM plus	Unit	Dimension A
3.5kW	mm	765
5kW	mm	765
7kW	mm	965
10kW	mm	1565
12kW	mm	1565

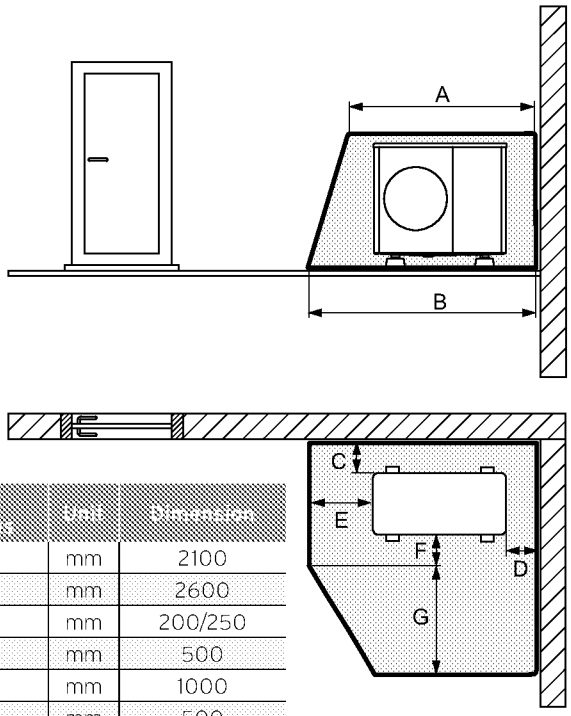
Minimum clearance	Unit	Heating mode	Heating and cooling mode
A	mm	100	100
B	mm	1000	1000
C	mm	200	250
D	mm	500	500
E	mm	600	600

R290 clearances

Clearances required for any drains, light wells or other openings



Minimum clearance	Unit	Dimension
A	mm	2100
B	mm	3100
C	mm	200/250
D	mm	1000

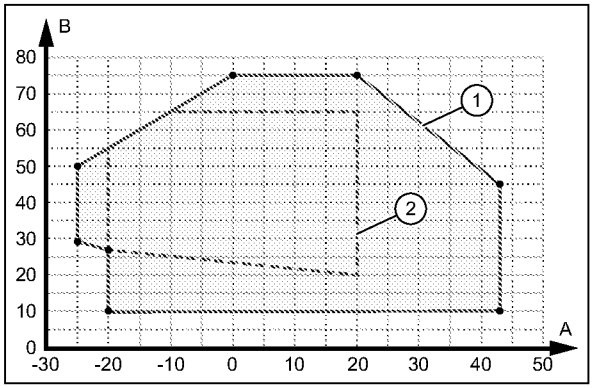


Minimum clearance	Unit	Dimension
A	mm	2100
B	mm	2600
C	mm	200/250
D	mm	500
E	mm	1000
F	mm	500
G	mm	1800

Application limits

heating mode

In heating mode, the product works at outdoor temperatures of -25 °C to 46 °C



A Outdoor temperature

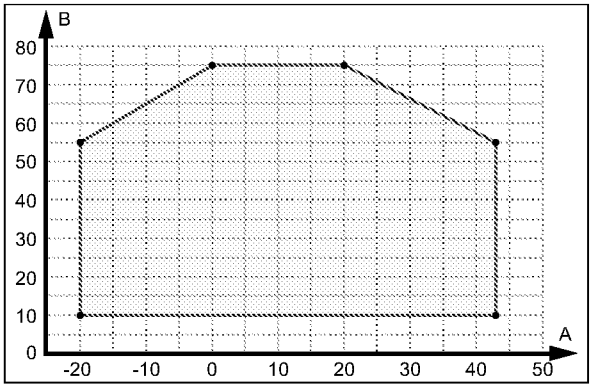
B Heating water temperature

1 Application limits, heating mode

2 Area of application, in accordance with EN 14511

DHW mode

For domestic hot water generation, the product works at outdoor temperatures of -20 °C to 46 °C.



A Outdoor temperature

B Heating water temperature

Technical specifications

aroTHERM plus	Unit	3.5kW VWL 35 / 6	5kW VWL 55 / 6	7kW VWL 75 / 6	10kW VWL 105 / 6	12kW VWL 125 / 6
General						
Width	mm	1,100				
Height	mm	765		965		1,565
Depth	mm	450				
Weight, ready for operation	kg	114		128		194
Connection, heating circuit		G 1 1/4"				
Rated voltage	V	230 V (+10%/- 15%), 50 Hz, 1~/N/PE				
Rated current, maximum	A	14.3		15.0		23.3
Fuse size		16				25
Fuse type	A	C/D				
RCD type		A				
eBUS (2-core communication cable)	mm2	0.75				
Maximum length eBUS cable (communication cable)	m	50				
IP rating		IP 15 B				
Fan, power consumption	W	40				50
Fan quantity		1				2
Fan, air flow , maximum	m^3 /h	2,300				5,100
Heating pump, power consumption	W	2 - 50				3 - 87
Heating circuit						
Heating water temperature, minimum/maximum	° C	20 - 75				
Basic length of the heating water pipe, maximum, between the outdoor unit and indoor unit	m	20				
Operating pressure, minimum	bar	0.50				
Operating pressure, maximum	bar	3.00				
Volume flow, minimum	l/h	400		540		995
Volume flow, maximum	l/h	860		1,205		2,065
Water volume, in the outdoor unit	l	1.5		2.0		2.5
Water volume, in the heating circuit, minimum, thawing mode, activated/deactivated back-up heater	l	15 / 40		20 / 55		45 / 150
Remaining feed pressure, hydraulic	kPa (mbar)	56.0 (560.0)		44.0 (440.0)		55.0 (550.0)

aroTHERM plus	Unit	3.5kW VWF 35 / 6	5kW VWL 55 / 6	7kW VWL 75 / 6	10kW VWL 105 / 6	12kW VWF 125 / 6
Refrigerant circuit						
Fluid type		R290				
Fluid fill quantity	kg	0.6		0.9	1.3	
Refrigerant, Global Warming Potential (GWP)		3				
CO_2 equivalent	t	0.0018		0.0027	0.0039	
Permissable operating pressure	bar	31.5				
Compressor type		Rotary piston			Scroll compressor	
Compressor oil type		Specific polyalkylene glycol (PAG				
Compressor, control		Electronic				

Noise emissions, heating mode				
Sound power, EN 12102, EN 14511 LWA, A7/W35	dB(A)	51	53	58
Sound power, EN 12102, EN 14511 LWA, A7/W45	dB(A)	53		58
Sound power, EN 12102, EN 14511 LWA, A7/W55	dB(A)	54	55	60

Efficiency		
Energy efficiency class 35°C	(A+++ to F)	A+++
Energy efficiency class 55°C	(A+++ to F)	A++
Combination with auroTOWER		
Energy efficiency class	(A+++ to F)	A++
Energy efficiency class for hot water supply	(A+ to F)	A

auroTOWER	Unit	VIH QW 190 / 6
Total storage cylinder capacity	l	188
Temperature hot water (max. – with auxiliary heating)	°C	55 - 75
Dimensions, unpacked (height/width/depth)	mm	1880 x 599 x 693
Weight, unpacked	kg	175
Auxiliary electric heater	kW	6kW (230V/50Hz) / 9kW (400V/50Hz)

Hydraulic station	Unit	VWZ MEH 97
Dimensions, unpacked (height/width/depth)	mm	720 x 440 x 350
Weight, unpacked	kg	15
Power electric backup heater	kW	6 kW (230V/50Hz) / 9 kW (400V/50Hz)

Description	Article number
aroTHERM plus with heat pump interface	
aroTHERM plus 3.5kW - VWL 35 / 6	0010037211
aroTHERM plus 5kW - VWL 55 / 6	0010037212
aroTHERM plus 7kW - VWL 75 / 6	0010037213
aroTHERM plus 10kW - VWL 105 / 6	0010037214
aroTHERM plus 12kW - VWL 125 / 6	0010037215
aroTHERM plus with hydraulic module	
aroTHERM plus 3.5kW - VWL 35 / 6	0010037206
aroTHERM plus 5kW - VWL 55 / 6	0010037207
aroTHERM plus 7kW - VWL 75 / 6	0010037208
aroTHERM plus 10kW - VWL 105 / 6	0010037209
aroTHERM plus 12kW - VWL 125 / 6	0010037210
aroTHERM plus with uniTOWER	
aroTHERM plus 3.5kW - VWL 35 / 6	0010037201
aroTHERM plus 5kW - VWL 55 / 6	0010037202
aroTHERM plus 7kW - VWL 75 / 6	0010037203
aroTHERM plus 10kW - VWL 105 / 6	0010037204
aroTHERM plus 12kW - VWL 125 / 6	0010037205

Compatible with

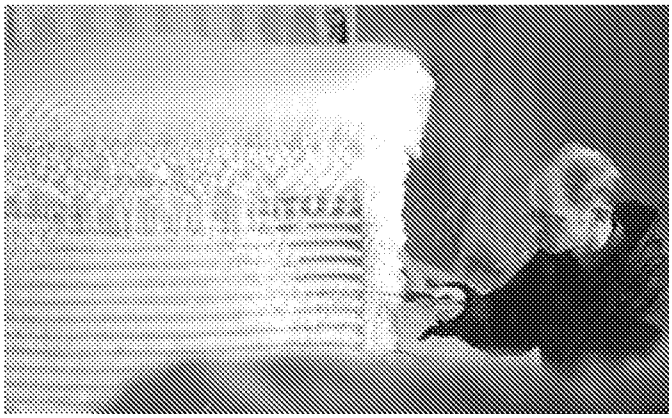
Accessories	Article number
aroTHERM connection kit for ground install	0010027971
aroTHERM connection kit for ground install extension	0010027972
aroTHERM connection kit for wall install	0010027974
aroTHERM straight pipe connection kit	0010027976
750mm flexihose for air-to-water heat pump (pair)	0020165288
Snow Spacer	0010027984
Wall bracket for insulated wall	0020250224
Wall bracket for non-insulated wall	0020250225
Anti-vibration feet large	0020250226
Anti-vibration rubber feet small	0020252091
Coding resistor active cooling	0020269259
Discharge vessel	0020145563
aroTHERM 45 litre buffer	0010038365
aroTHERM heat exchanger module	0020222285
aroTHERM inline 6kW back-up heater	0020222286
VR 10 temperature sensor	306787
WH40 low-loss header (flow rates up to 3,000 litres per hour)	306720
WH95 low-loss header (flow rates up to 8,000 litres per hour)	306721
VR 32/B eBUS coupler (includes housing)	0020235465
VR 32 eBUS coupler	0020139895
Ball filter valve 28mm	0010038133
uniTOWER accessories	
uniTOWER decoupling module (small) for 3.5 - 7kW model	0010027982
uniTOWER decoupling module (large) for 10 and 12kW model	0010027973
uniTOWER 1" adapter connection kit	0020269275
18l Buffer cylinder for uniTOWER	0020269273
uniTOWER multi-zone kit - 1 direct zone	0020170507
uniTOWER extension set - 2 direct zones	0020170509
uniTOWER extension set - 1 mixed zone	0020170508
Circulation set without pump	0020170502
Circulation set with pump	0020170503
2l brine expansion vessel	0010030975

Description	Part combination	Article number
VRC 700		
VRC 700 wired, weather compensating programmable room thermostat	-	0020236291
VRC 700f wireless, weather compensating, programmable room thermostat	-	0020259829
One wired heating zone and hot water system	VRC 700, VR 70	0020236292
One wireless heating zone and hot water system	VRC 700f, VR 70	0020259830
One wired heating zone and solar thermal hot water system	VRC 700, VR 70, VR 11	0020236295
One wireless heating zone and solar thermal hot water system	VRC 700f, VR 70, VR 11	0020259833
Two wired heating zones and hot water system	VRC 700, VR 70, VR 91	0020236293
Two wireless heating zones and hot water system	VRC 700f, VR 70, VR 91f	0020259831
Two wired heating zones and solar thermal hot water system	VRC 700, VR 70, VR 11, VR 91	0020259834
Two wireless heating zones and solar thermal hot water system	VRC 700f, VR 70, VR 11, VR 91f	0020259835
Three wired heating zones and hot water system	VRC 700, VR 71, two VR 91	0020236294
Three wireless heating zones and hot water system	VRC 700f, VR 71, two VR 91f	0020259832
VR 70 wiring centre for up to two zones	-	0020184844
VR 71 wiring centre for up to three zones	-	0020184847
VR 91 wired, additional room thermostat	-	0020171334
VR 91f wireless, additional room thermostat	-	0020231566
VR 40 two-in-seven multifunction module	-	0020017744
VR 11 solar collector NTC	-	306788
VR 10 immersion or contact sensor bare ends	-	306787
VR 32 eBUS coupler	-	0020139895
sensoCOMFORT		
sensoCOMFORT wired weather compensating programmable room thermostat	-	0010036819
sensoCOMFORT RF wireless weather compensating programmable room thermostat	-	0010036820
One wired heating zone and hot water system	sensoCOMFORT, VR 71	0010036821
One wireless heating zone and hot water system	sensoCOMFORT RF, VR 71	0010036826
Two wired heating zones and hot water system	sensoCOMFORT, VR 71, VR 92	0010036822
Two wireless heating zones and hot water system	sensoCOMFORT RF, VR 71, VR 92f	0010036827
Three wired heating zones and hot water system	sensoCOMFORT, VR 71, 2x VR 92	0010036823
Three wireless heating zones and hot water system	sensoCOMFORT RF, VR 71 and 2x VR 92f	0010036828
Four wired heating zones and hot water system	sensoCOMFORT, VR 71, VR 70, 3x VR 92	0010036824
Five wired heating zones and hot water system	sensoCOMFORT, VR 71, VR 70, 4x VR 92	0010036825
VR 10 immersion or contact sensor bare ends	-	306787
VR 32 eBUS coupler	-	0020139895
VR 70 wiring centre	-	0020184844
VR 71 wiring centre	-	0020184847
VR 92 wired additional room thermostat	-	0020260925
VR 92f wireless additional room thermostat	-	0020260940
sensoNET internet gateway	-	0020260963
VR 40 two-in-seven multifunctional module	-	0020017744
VR 32/B eBUS coupler (includes housing)	-	0020235465

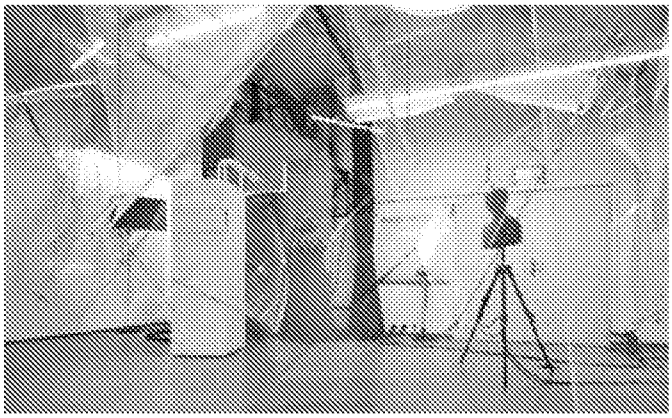
Our experience is your guarantee

For over 140 years, Vaillant has been among the technology leaders when it comes to innovative heating solutions, with specific expertise in the area of heat pumps for more than 40 years. Our proprietary solutions - many of which are patented - have made this technology reliable, efficient and suitable for everyday life. More than 200,000 heat pumps installed around the world prove this in use each day. Benefit from our experience:

- Products developed in Germany and manufactured exclusively in the EU
- 100% test for each heat pump on the production line
- Toughest weather conditions simulated at our own test centres, in cold chambers with temperatures down to -25°C
- Vaillant heat pumps are among the quietest on the market
- High level of safety due to use of playground standards
- Quality management as per EN ISO 9001 and EN ISO 14001



Climatic chambers simulate all possible operating conditions



Optimisation of components in the acoustic lab

Renewable service and technical enquiries
For technical assistance:
Telephone: 0330 100 3540
Email: aftersales@vaillant.co.uk

General enquiries
If you have a general enquiry our friendly reception staff will happily point you in the right direction:
Telephone: 0345 602 2922

Training enquiries
Vaillant provides many different training courses. For more information:
Telephone: 0345 601 8885
Email: training@vaillant.co.uk

VaillantUK
vaillantuk
VaillantUK
vaillant.uk
Vaillant UK

Vaillant

Heating Hot water Renewables

Vaillant Group UK Ltd.
Nottingham Road, Belper, Derbyshire DE56 1JT
[redacted]
info@vaillant.co.uk