ENERGY ASSESSMENT

FOR

LANSDOWNE ROAD
ARUNDEL AND BALDEWYNNE COURTS

VERSION 3.0

Issued by:-

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CONTENTS

LANSDOWNE ROAD, ARUNDEL & BALDEWYNNE COURTS

ENERGY ASSESSMENT

Clause	Description	Page No.
PROJECT REVISION SHEET		**3**
EXECUTIVE SUMMARY		**4**
1	**INTRODUCTION**	**6**
1.1	Background	6
1.2	Description of the Site and Building	6
2	**RELEVANT PLANNING POLICIES**	**7**
2.1	National Planning Policy	7
2.2	Regional Policy – The London Plan (2021)	8
2.3	Local Policy – London Borough of Haringey	11
3	**ENERGY DEMAND ASSESSMENT**	**13**
3.1	National Calculation Methodology (NCM)	13
4	**ENERGY EFFICIENT DESIGN**	**14**
4.1	Dwellings	14
4.2	Summary of Energy & Carbon Emissions Following Energy Demand Reduction	15
5	**RISK OF OVERHEATING**	**17**
5.1	Dwellings	17
6	**HEATING INFRASTRUCTURE**	**18**
7	**LOW & ZERO CARBON TECHNOLOGIES FOR ENERGY PRODUCTION**	**19**
7.1	Preliminary Technology Appraisal	19
7.2	Photovoltaic Panels	21
7.3	Air Source heat Pumps	22
7.4	Energy & Carbon Emissions Following the Application of Renewable Technologies	23
8	**CONCLUSIONS**	**25**
A1	**APPENDIX 1 - RENEWABLE ENERGY OVERVIEW**	**26**
A1.1	Biofuels	26
A1.2	Air and Ground Source Heat Pumps	27
A1.3	Solar Water Heating Systems	28
A1.4	Photovoltaics	28
A1.5	Wind Energy	28
A2	**APPENDIX 2 – WATER CALCULATOR**	**30**
A3	**APPENDIX 3 – LEAN TER,DER AND SAP INPUTS**	**32**
A4	**APPENDIX 4 – GREEN TER,DER AND SAP INPUTS**	**33**

PROJECT REVISION SHEET

LANSDOWNE ROAD
ARUNDEL AND BALDEWYNNE COURTS

210040

Revision V3.0

Date of first issue – 11 May 2021

Prepared by: Andrew Sturt

Revision	Date	Details	Changes	Author	Checked
1.0	11-05-2021	Draft for Comment	-	A Sturt	
2.0	18-02-2022	Draft for Comment	Updated to suit revised scheme	A Sturt	A Singh
3.0	05-02-2024	Planning issue	Updated to suit revised scheme	A Surt	P Lindsay

EXECUTIVE SUMMARY

Silcock Dawson and Partners have been appointed by the London Borough of Haringey to provide an Energy Assessment for the proposed new development at Lansdowne Road. This Energy Assessment is submitted as part of an application for full planning consent.

The development area covers four separate blocks as described below:

Arundel Court

The proposal is to demolish the garages and remove the parking area to the Lansdowne Road frontage and provide a mix of new homes. The proposal provides three new apartment buildings which are three storeys in height. The ground floor apartments comprise of 1 or 2 bedroom and wheelchair dwellings, all with their own front doors. The buildings are walk up blocks serving 2 x two bedroom apartments per floor.

Baldewyne Court

The proposal is to demolish the garages and remove the parking area to the Lansdowne Road frontage and provide a mix of new homes. The proposal provides two new apartment buildings which are three storeys in height. The ground floor apartments comprise of 1 or 2 bedroom and wheelchair dwellings, all with their own front doors. The buildings are walk up blocks serving 2 x two bedroom apartments per floor

The dwellings will be designed to be energy efficient and incorporate the following key features:

1. The annual heating demand will be reduced by using insulation values equal to or better than the Notional Building[1], internal walls and floor slabs between the conditioned spaces and unheated internal spaces such as the residential entrance lobbies and refuse stores will be insulated. The target air permeability is 1.5 $m^3/hr/m^2$.
2. The dwellings will have a balanced ventilation system with heat recovery and automatic summer bypass.
3. The dwellings will be provided with 100% low energy luminaires.

The London heat map and local heat mapping surveys have been consulted, and it is noted that the site is not close to an existing heat network, but is just within an indicative DENCZ 500m zone.

The small scale and spread of the of the development blocks is not suitable for a community heating system. Heat for the dwellings will be provided via dedicated air source heat pumps serving each dwelling. This approach minimises distribution losses, and gives the residents full control over the energy consumed. The heat pumps are predicted to reduce emission by 45% against gas fired boilers assessing the dwellings to SAP10.2 and part L 2021.

Photovoltaic panels will be mounted on the suitable areas of each building, amounting to a total installation of 27kWp with 0.9kWp fed directly to the individual dwellings.

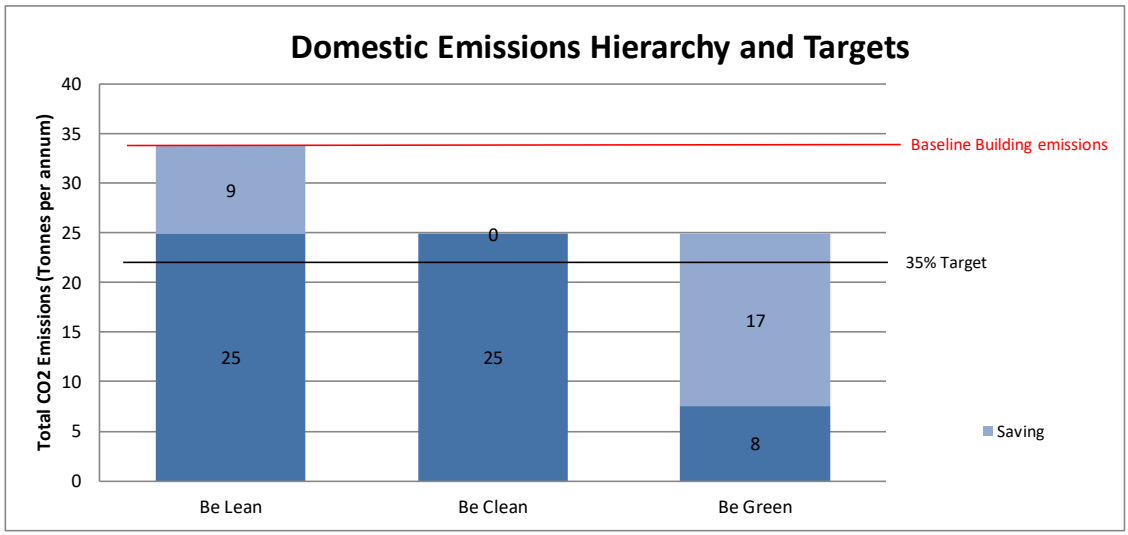
The total CO_2 reduction as a result of the energy efficiency measures is predicted to be 8.8 tonnes or 26% below the baseline model, with a total emissions reduction of 26.2 tonnes once renewable energy measures are incorporated as illustrated in the tables below.

[1] Notional building forms the basis of the Target Emission Rate (TER), which is the minimum energy performance requirement for a new building.

Table 1 - Domestic CO2 Emissions Reductions

Dwelling Carbon Dioxide Emissions from each stage of the Energy Hierarchy		
	Regulated Carbon dioxide savings	
	(Tonnes CO2 per annum)	(%)
Savings from energy demand reduction	8.8	26
Savings from CHP	0.0	0
Savings from renewable energy	17.4	51
Cumulative on site savings	26.2	78

Figure 1 - Domestic CO2 Hierarchy Targets



Following a review of the relevant National and Local Planning Policies, this Energy Assessment proposes a strategy that positively responds to London Plan, Policies SI2, SI3, SI4 the Mayor's Energy Assessment Guidance, Haringey Local Plan (2017) SP4 and Development Management Policy DM21.

The zero carbon homes CO_2 offset payment is calculated to be £21,634 for the dwellings based on £95.00 / tonne over a 30 year period.

1 INTRODUCTION

1.1 Background

Silcock Dawson and Partners have been appointed by the London Borough of Haringey to provide an Energy Assessment for the proposed new development at Lansdowne Road

The aim of this report is to document the findings of the investigation into energy efficiency measures and the feasibility of on-site decentralised and renewable or low carbon energy sources.

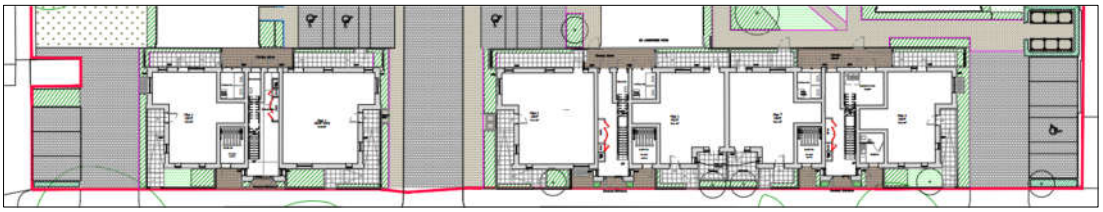
1.2 Description of the Site and Building

The development area covers four separate blocks as described below:

Arundel Court

The proposal is to demolish the garages and remove the parking area to the Lansdowne Road frontage and provide a mix of new homes. The proposal provides three new apartment buildings which are three storeys in height. The ground floor apartments comprise of 1 bedroom and wheelchair dwellings, all with their own front doors. The buildings are walk up blocks serving 2 x two bedroom apartments per floor.

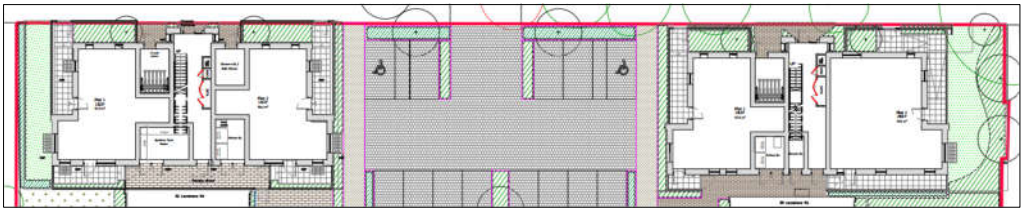
Figure 2 – Arundel Court



Baldewyne Court

The proposal is to demolish the garages and remove the parking area to the Lansdowne Road frontage and provide a mix of new homes. The proposal provides three new apartment buildings which are three storeys in height. The ground floor apartments comprise of 1 bedroom and wheelchair dwellings, all with their own front doors. The buildings are walk up blocks serving 2 x two bedroom apartments per floor.

Figure 3 - Baldewyn Court



2 RELEVANT PLANNING POLICIES

This Energy Strategy responds to the broader set of national, and regional policies outlined below.

2.1 National Planning Policy

The Government has set out a planning policy framework guidance in the National Planning Policy Framework (NPPF) (Dec 2023), within which planning authorities can prepare and apply their development plans. Fundamental to this guidance is the requirement to meet sustainable development objectives.

The NPPF covers a wide range of planning issues from promoting sustainable transport to facilitating the sustainable use of minerals. Climate change is covered in section 14 'Meeting the challenge of climate change, flooding and coastal change'. In summary the framework advises:

"Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

New development should be planned for in ways that:

- avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and
- can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

To help increase the use and supply of renewable and low carbon energy and heat, plans should:

- provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
- consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
- identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers."

Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.

In determining planning applications, local planning authorities should expect new development to:

- comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
- take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

When determining planning applications for renewable and low carbon development, local planning authorities should:

- not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to significant cutting greenhouse gas emissions;
- approve the application if its impacts are (or can be made) acceptable58. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

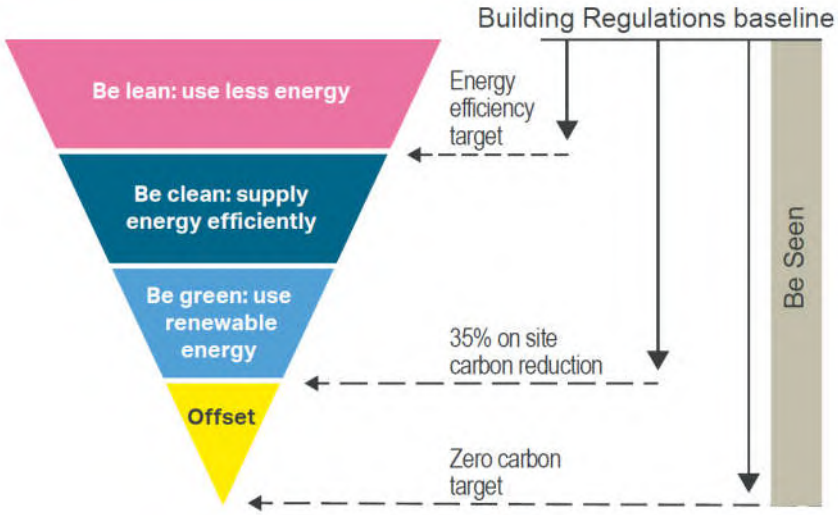
Refer to : National Planning Policy Framework (2023) for further details.

2.2 Regional Policy – The London Plan (2021)

2.2.1 Policy SI 2 Minimising Greenhouse Gas Emissions

A Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

1. be lean: use less energy and manage demand during operation.
2. be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly.
3. be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site.
4. be seen: monitor, verify and report on energy performance.



Source: Greater London Authority

B Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy

C A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

1. through a cash in lieu contribution to the borough's carbon offset fund, or
2. off-site provided that an alternative proposal is identified and delivery is certain.

D Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.

E Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.

F Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.

2.2.2 Policy SI 3 Energy Infrastructure

A Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy and infrastructure requirements arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development.

B Energy masterplans should be developed for large-scale development locations (such as those outlined in Part A and other opportunities) which establish the most effective energy supply options. Energy masterplans should identify:

1. major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing)
2. heat loads from existing buildings that can be connected to future phases of a heat network
3. major heat supply plant including opportunities to utilise heat from energy from waste plants
4. secondary heat sources, including both environmental and waste heat
5. opportunities for low and ambient temperature heat networks
6. possible land for energy centres and/or energy storage
7. possible heating and cooling network routes
8. opportunities for future proofing utility infrastructure networks to minimise the impact from road works
9. infrastructure and land requirements for electricity and gas supplies
10. implementation options for delivering feasible projects, considering issues of procurement, funding and risk, and the role of the public sector
11. opportunities to maximise renewable electricity generation and incorporate demand-side response measures.

C Development Plans should:

1. identify the need for, and suitable sites for, any necessary energy infrastructure requirements including energy centres, energy storage and upgrades to existing infrastructure
2. identify existing heating and cooling networks, identify proposed locations for future heating and cooling networks and identify opportunities for expanding and inter-connecting existing networks as well as establishing new networks.

D Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system

1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

a) connect to local existing or planned heat networks

b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)

c) use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)

d) use ultra-low NOx gas boilers.

2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements of policy SI 1 Improving Air Quality.

3) where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date.

E Heat networks should achieve good practice design and specification standards for primary, secondary and tertiary systems comparable to those set out in the CIBSE CP1 Heat Networks: Code of Practice for the UK or equivalent.

2.2.3 Policy SI 4 Managing Heat Risk

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

B Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure

2) minimise internal heat generation through energy efficient design

3) manage the heat within the building through exposed internal thermal mass and high ceilings

4) provide passive ventilation

5) provide mechanical ventilation

6) provide active cooling systems.

2.2.4 Policy SI 5 Water Infrastructure

A In order to minimise the use of mains water, water supplies and resources should be protected and conserved in a sustainable manner.

B Development Plans should promote improvements to water supply infrastructure to contribute to security of supply. This should be done in a timely, efficient and sustainable manner taking energy consumption into account.

C Development proposals should:

1) through the use of Planning Conditions minimise the use of mains water in line with the Optional Requirement of the Building Regulations (residential development), achieving mains water consumption of 105 litres or less per head per day (excluding allowance of up to five litres for external water consumption)

2) achieve at least the BREEAM excellent standard for the 'Wat 01' water category164 or equivalent (commercial development)

3) incorporate measures such as smart metering, water saving and recycling measures, including retrofitting, to help to achieve lower water consumption rates and to maximise future-proofing.

D In terms of water quality, Development Plans should:

1) promote the protection and improvement of the water environment in line with the Thames River Basin Management Plan, and should take account of Catchment Plans

2) support wastewater treatment infrastructure investment to accommodate London's growth and climate change impacts. Such infrastructure should be constructed in a timely and sustainable manner taking account of new, smart technologies, intensification opportunities on existing sites, and energy implications. Boroughs should work with Thames Water in relation to local wastewater infrastructure requirements.

E Development proposals should:

1) seek to improve the water environment and ensure that adequate wastewater infrastructure capacity is provided

2) take action to minimise the potential for misconnections between foul and surface water networks.

F Development Plans and proposals for strategically or locally defined growth locations with particular flood risk constraints or where there is insufficient water infrastructure capacity should be informed by Integrated Water Management Strategies at an early stage

2.3 Local Policy – London Borough of Haringey

2.3.1 Strategic Policy SP4

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

1. In line with London Plan policy, the Council will promote and require all new developments to take measures to reduce energy use and carbon emissions during design, construction and occupation, by incorporating the following measures:

a. From 2011 onwards, all new residential development will achieve a minimum 25%reduction in total (regulated) CO2 emissions in line with Code for Sustainable Homes Level 4 energy standards, and should aim to achieve Level 6. All new residential development shall be zero carbon from 2016 onwards; and

b. From 2011 onwards all new non-residential development shall be built to at least BREEAM "very good" standard and should aim to achieve BREEAM "excellent" or the current nationally agreed standard. All new non-residential development shall be zero carbon from 2019.

2. The Council will promote low- and zero-carbon energy generation through the following measures:

a. Requiring all developments to assess, identify and implement, where viable, site-wide and area-wide decentralised energy facilities including the potential to link into a wider network;

b. Establishing local networks of decentralised heat and energy facilities by requiring developers to prioritise connection to existing or planned networks where feasible;

c. Working with neighbouring boroughs and other partners to explore ways of implementing

sub-regional decentralised energy networks including the potential in the Upper Lee Valley Opportunity Area; and

d. All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from on site renewable energy regeneration, which can include connections to local sources of decentralised renewable energy.

2.3.2 Development Management Policy DM21: Sustainable Design, Layout and Construction

A All new development, including building and landscape works, will be expected to consider and implement sustainable design, layout and construction techniques. Proposals should:

a Apply the energy hierarchy to minimise energy use in order to meet, and if possible exceed, minimum carbon dioxide reduction requirements;

b Apply the cooling hierarchy to reduce the potential for overheating and limit reliance on mechanical air conditioning systems;

c Maximise opportunities to enhance biodiversity on-site, including through appropriate landscaping, Sustainable Drainage Systems, living roofs and green walls

d Wherever possible, use building materials with high environmental performance ratings; and

e Seek opportunities for locally sourced labour.

B The Council will support appropriate measures to sustainably retrofit existing homes and non-residential buildings.

C Proposals that fail to demonstrate adequate consideration for sustainable design, layout and construction techniques will be resisted.

D Consideration will be given to the use of carbon offset payments, to be secured by planning obligations, where it can be demonstrated that proposals are unable to meet carbon dioxide emission reduction targets on-site.

3 ENERGY DEMAND ASSESSMENT

3.1 National Calculation Methodology (NCM)

The baseline energy use and resulting carbon emission rate of the development has been assessed using the Part L 2021 methodology for the calculation of the regulated energy, such as space heating and domestic hot water consumption.

The emissions for the dwellings are based on a representative sample of dwellings covering the lower mid level and top floors and orientations. The emissions were calculated using Elmhurst SAP10 software and unregulated emissions calculated using the BREDEM methodology.

Emissions within this report are based on SAP 10.2 emission rates in accordance with GLA energy guidance as listed below.

Electricity consumed and generated emission rates.

Month											
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
0.163	0.160	0.153	0.143	0.132	0.120	0.111	0.112	0.122	0.136	0.151	0.163

4 ENERGY EFFICIENT DESIGN

4.1 Dwellings

4.1.1 Passive Design Measures

The dwellings design will target highly efficient U-values for windows and air tightness.

Table 2 - Dwelling Fabric Performance

Fabric Performance		
Element	**Notional (Baseline) Dwelling** **Building Regulations, Part L1A 2013**	**Proposed Measures**
Air Tightness	5 0m^3/hr per m²	1.5m^3/hr per m²
External Wall U-Value	0.18 W/m²K	0.14 W/m²K
Exposed Floor	0.13 W/m²K	0.11 W/m²K
Roof	0.13 W/m²K	0.11 W/m²K
Walls to unheated spaces*	0.13 W/m²K	0.16 W/m²K
Party Wall**	0.00 W/m²K	0.00 W/m²K
Window*** U-Value	1.4 W/m²K	0.9 W/m²K
Glazing G-Value	0.63	0.4
Glazing LT	-	0.7

* Includes corridors, stairwells, and risers.

** Wall between dwellings assumed to be constructed to approved method

*** Combination of frame and glazing

Table 3 - Thermal Bridging Performance

Thermal Bridging	Notional Dwelling	Proposed Measures
External Junctions	SAP Appendix R, Table R2	SAP Appendix R, Table R2

The above values demonstrate a series of measures that satisfy the energy efficiency standards, however, the final designed solution may vary during the detailed design stage.

4.1.2 Heating, Cooling and Ventilation

The dwellings will be served by dedicated air source heat pumps. As these are considered a renewable technology, the Lean building model is based on gas fired boilers with the following efficiencies as the Notional Dwellings.

Winter: 88.8%

Summer: 79.8%

Comfort cooling will not be provided to the dwellings, however, the Environmental Noise Assessment has identified that ambient noise levels are above the recommended levels for natural ventilation to be used to mitigate against overheating. This is discussed in more detail in section 5.

It is proposed that packaged cooling modules will be integrated within the MVHR ductwork system to prevent the dwellings from overheating if the windows remain in the closed position for extended periods when natural ventilation would otherwise mitigate the overheating risk. The suggested cooling modules are not subject to the Part L / SAP assessment methodology.

Ventilation to the dwellings will be via balanced systems with heat recovery (MVHR). The MVHR unit used within the assessment is a Zehnder ComfoAir Q350 GB ST with the following SAP appendix Q test data; however, final unit selection will form part of the detailed design.

Table 4 - MVHR Performance

K+n wet rooms	SFP (W/l/s)	Efficiency (%)
n = 1	**0.6**	**96%**

4.1.3 Hot Water

The lean dwellings use a similar hot water delivery system to the Green Building model. As the space heating and hot water will be generated by heat pumps a hot water cylinder will be necessary. A 150lt vessel with factory fitted insulation has been assumed for all dwellings.

4.1.4 Lighting

Within the dwellings, all fixed light fittings will be low energy lamps, including storage and infrequently accessed areas. An average lamp efficacy of 100lm/W has been assumed for all apartments.

The lighting to common areas will be provided with PIR movement detectors and daylight control where appropriate.

4.1.5 Unregulated Energy

Unregulated energy is estimated in accordance with the BREDEM methodology.

4.2 Summary of Energy & Carbon Emissions Following Energy Demand Reduction

The tables below illustrate a full breakdown of the energy consumed plus the effect of the PV panels applied within the notional dwellings due to the use of gas fired boilers. In accordance with GLA Energy Assessment Guidance the equivalent PV installation is applied to the Lean Dwellings model to demonstrate the effect of the of the lean building measures.

Table 5 - Baseline Dwelling Energy Consumption and Emissions

Energy Consumption for energy baseline dwellings			
Item	**kWhrs/m² / Year**	**kWhrs/ Year**	**Kg CO_2 /year**
Heating	47.3	97,833	20,545
DHW	38.1	78,830	16,554
Cooling	0.0	0	0
Auxiliary Energy	1.2	2,580	358
Lighting	2.5	5,125	740
PV	-16.5	-34,064	-4,414
Equipment	35.1	72,526	9,863
Total	**108**	**222,830**	**43,647**
Total no Equip	**73**	**150,305**	**33,783**

Table 6 - Be Lean Energy Efficient Dwellings

Energy Consumption for Lean dwellings			
Item	**kWhrs/m² / Year**	**kWhrs/ Year**	**Kg CO_2 /year**
Heating	18.8	38,947	8,179
DHW	44.3	91,574	19,230
Cooling	0.0	0	0
Auxiliary Energy	4.3	8,936	1,240
Lighting	2.4	4,899	707
PV	-16.5	-34,063.8	-4,414
Equipment	35.1	72,526	9,863
Total	**88**	**182,818**	**34,806**
Total no Equip	**53**	**110,293**	**24,942**

Table 7 - Energy Efficiency CO2 Reduction (Tonnes)

Dwelling Carbon Dioxide Emissions after each stage of the Energy Hierarchy		
	Carbon dioxide emissions (Tonnes CO2 per annum)	
	Regulated	**Unregulated**
Building Regulations 2021 Part L compliant	33.8	10
After energy demand reduction	24.9	10

Table 8 - Energy Efficiency CO2 Reduction (%)

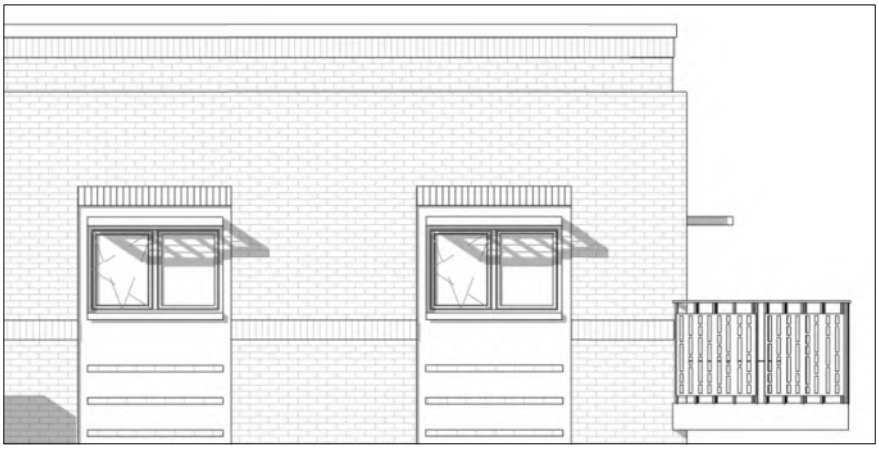
Dwelling Carbon Dioxide Emissions from each stage of the Energy Hierarchy		
	Regulated Carbon dioxide savings	
	(Tonnes CO2 per annum)	**(%)**
Savings from energy demand reduction	8.8	26

The above results demonstrate that the Lean Building measures result in a 26% CO_2 reduction against the GLA target of 10%.

5 RISK OF OVERHEATING

5.1 Dwellings

All apartments are dual aspect and have the potential for cross ventilation. In addition balconies are provided for the first and second apartments which will provide shading to the floors below. The design of the balconies also provides a degree of vertical shade, which extend to high level second floor and is supplemented by a horizontal element to provide further shade as detailed in the image below.



To minimise solar gains the all windows will have solar control glazing, incorporating a G value of 0.40 (a typical double glazed window would have a G value close to 0.65) and light transmission of 70%.

The building will be constructed using structural block and brickwork walls which will increase the thermal mass of the apartments.

It is noted that the Noise Impact Assessment has identified that excessive ambient noise levels are present in the vicinity of the development, resulting in unacceptable internal noise levels being present when the windows are opened. To overcome the risk of overheating by allowing the windows to remain in the closed position it is proposed that packaged cooling modules will be incorporated into the MVHR ductwork installation. The available cooling duty is relatively small and the units do not provide full air conditioning. Their purpose is to just limit the number of hours when high temperatures are experienced.

A representative sample of 24 apartments have been assessed in accordance with the requirements of CIBSE TM59, and found to be compliant when assessed as predominantly naturally ventilated (windows open without cooling module activation) and as predominantly mechanically ventilated (windows closed and cooling modules activated). Giving the residents the flexibility to choose if the cooling modules are operated.

Full details of the assessment and results including future weather scenarios are included within the Dwelling Overheating Risk Assessment, see Appendix 3.

6 HEATING INFRASTRUCTURE

In accordance with GLA Energy Assessment Guidance (2022) and London Plan Policy SI3, the energy systems for the site have been determined in accordance with the following hierarchy:

1. Connection to local existing or planned heat networks.
2. Use zero emission or local secondary heat sources (in conjunction with heat pump if required)
3. Use low-emission combined heat and power (Only where there is a case for CHP to enable the delivery of an area wide heat network, meet the developments electricity demand and provide demand response to the local electricity network))
4. Use ultra low NOx gas boilers

In a communal energy system, energy in the form of heat, cooling, and/or electricity is generated from a central source and distributed via a network of insulated pipes to surrounding residencies and commercial units.

The London Heat map has been reviewed and the site is within an area of opportunity for district heating. The site is also just within an area identified as DENCZ 500m, but given that the low density of the development a community heating system would lead to higher fuel costs due to the high distribution losses that would be expected over such a wide area. Therefore a community heating system is not recommended for this development in lieu of heat pumps installed to each dwelling.

Figure 4 - Extract from Haringey Development management Policy DM22

7 LOW & ZERO CARBON TECHNOLOGIES FOR ENERGY PRODUCTION

This section of the report responds to London Plan Policy 5.7

The use of energy conversion technologies using renewable energy have been reviewed and summarised below. The main technologies available for on-site renewable energy generation are:

- Biomass
- Ground Source Heat Pumps
- Air Source Heat Pumps
- Photovoltaic Panels
- Solar Thermal Hot Water Generation
- Wind
- CHP

Refer to Appendix 1 for more details and a brief explanation of renewable energy technologies.

7.1 Preliminary Technology Appraisal

Technology	Feasibility*			Comments
	H	M	L	
Biomass			✓	Not suitable for the site on grounds of fuel storage and deliveries within city centre site and wider issues relating to high levels of NOx and particulate matter generated from combusting biomass fuels.
Ground Source heat pumps			✓	Ground source heat pumps extract heat from the ground, and convert it to low grade heat for space heating and hot water. Despite the wider adoption of ground source heat pumps, the cost of installing bore holes can still be prohibitively expensive.
Air Source Heat Pumps	✓			Air source heat pumps extract heat from the air and convert it to low grade heat for space heating. Air source heat pumps are generally more cost effective than ground source heat pumps, and would be viable technology to supply space heating and hot water to the dwellings.
Photovoltaic Panels	✓			Photovoltaic modules convert daylight directly into DC electricity and can be integrated into buildings. Space is available at roof level to install several PV arrays.
Solar Hot water			✓	Solar thermal installations are a well established renewable energy system and can be one of the most cost-effective renewable energy systems available. Limited space available on the house and apartment roofs, and the electricity generated by the photovoltaic panels can be put to more

Technology	Feasibility*			Comments
	H	M	L	
				use by the residents particularly as the heat for hot water has the potential to be generated by an alternative low carbon heat source in the form of heat pumps.
Wind			✓	The urban environment and the close proximity of other buildings are not favourable conditions for the installation of wind turbines. The uneven air flow caused by surrounding buildings and the potential negative impact on the visual and noise amenity of the area militate against the use of wind turbines for this development.

H - High Feasibility - No Obvious restrictions

M - Medium feasibility - Significant issues that need to be addressed

L - Low feasibility – Site unlikely to support technology

Based on this preliminary evaluation, the following technologies will be assessed:

- Photovoltaic Panels (PV)
- Air source heat pumps

7.2 Photovoltaic Panels

7.2.1 Application

Photovoltaic modules convert daylight directly into DC electricity and can be integrated into buildings. Photovoltaics (PVs) are distinct from other renewable energy technologies since they have no moving parts to be maintained and are silent. PV systems can be incorporated into buildings in various ways: on sloped roofs and flat roofs, in facades, atria and shading devices. Modules can be mounted using frames or they can be fully incorporated into the actual building fabric; for example, PV roof tiles are now available which can be fitted in place of standard tiles. Since PVs generate DC output, an inverter and other equipment is needed to deliver the power to a building or the grid in an acceptable AC form.

7.2.2 Constraints

The following constraints have been identified for the application of the PV technology at the site.

1. Space allocated at 2nd floor for inverters.

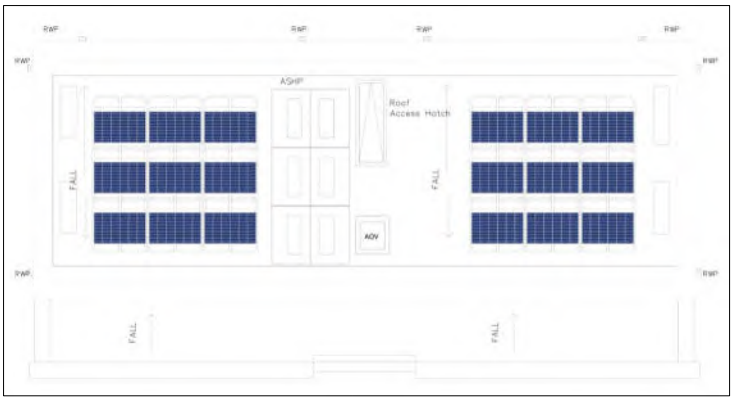
7.2.3 Emission Reduction

To maximise the power generated from the installation, the panels will be mounted to face between South East and South West where possible.

Space is available on the building roofs across the site to accommodate a 27kWp array. The SAP assessment methodology has been used to predict the energy generation at 16,427 kWh.

7.2.4 Conclusion

Photovoltaic panels are a viable technology for the development and a layout as indicated below for each block is predicted to reduce the emissions by 2.0 tonnes or 6%. Power generated from each bank of three panels shall be supplied to each apartment, with reminder used for landlord supplies.



Typical Roof PV layout

7.3 Air Source heat Pumps

7.3.1 Application

The technology makes use of the energy available in the ambient air. Essentially, heat pumps take up heat at a certain temperature and release it at a higher temperature. This is achieved by means of a simple heat exchanger in the case of air source heat pumps.

The efficiency of any type of heat pump is very much dependent on the temperature level at which it has to provide the heat: the lower the temperature level, the better the coefficient of performance.

Almost all heat pumps in operation are based on the vapour compression cycle, which combines efficiency, safety and reasonable cost. The efficiency of heat pumps is measured by the ratio of the heating capacity to the power input, referred to as the Coefficient of Performance (COP).

The performance of heat pumps can vary significantly depending on the unit, refrigerant and capacity. Therefore at this stage the SAP default performance values have been used, this should ensure that the installed equipment performs no worse than assumed within this assessment. The system flow temperature has been set at 55°C.

7.3.2 Constraints

The following constraints have been identified for the application of air source heat pump technology at the site.

1. Space needs to be allocated for the heat pumps in a location that provides a good air flow through and around the units.

2 Locating the heat pumps on the roof of the apartments will make maintenance more straight forward, reducing the need to access the dwellings.

7.3.3 Emission Reduction

The ASHP installation is predicted to reduce the overall emissions across the development by 16.7 tonnes.

7.3.4 Conclusion

Air source heat pumps are a viable technology for the development reducing the emissions by 45%

7.4 Energy & Carbon Emissions Following the Application of Renewable Technologies

Introducing PV panels and air source heat pumps to the apartments has the effect of reducing the emissions by 18.7 tonnes or 55% as illustrated in the tables below.

Table 9 - Dwelling Energy and CO2 Breakdown following Green Measures

Energy Consumption for Green Dwellings			
Item	**kWhrs/m² / Year**	**kWhrs/ Year**	**Kg CO_2 /year**
Heating (Heat Pump)	7.9	16,262	2,547
DHW (Heat Pump)	19.0	39,366	5,547
Cooling	0.0	0	0
Auxiliary Energy	3.1	6,356	882
Lighting	2.4	4,899	707
PV Electricity	-7.9	-16,427	-2,091
Equipment	35.1	72,526	9,863
Total	**59**	**122,982**	**17,454**
Total no Equip	**24**	**50,457**	**7,591**

Table 10 - Total Dwelling CO2 reduction (Tonne)

Dwelling Carbon Dioxide Emissions after each stage of the Energy Hierarchy		
	Carbon dioxide emissions (Tonnes CO2 per annum)	
	Regulated	**Unregulated**
Building Regulations 2021 Part L compliant	33.8	10
After energy demand reduction	24.9	10
After CHP	24.9	10
After Renewable Energy	7.6	10

Table 11 - Total Dwelling CO2 Reduction (%)

Dwelling Carbon Dioxide Emissions from each stage of the Energy Hierarchy		
	Regulated Carbon dioxide savings	
	(Tonnes CO2 per annum)	**(%)**
Savings from energy demand reduction	8.8	26
Savings from CHP	0.0	0
Savings from renewable energy	17.4	51

8 BE SEEN

GLA Energy Assessment Guidance advises that it is acceptable to use the energy consumption from SAP assessments within the Be Seen reporting and energy in use calculations.

Each apartment block comprises six apartments and would be considered a Reportable Unit for Be Seen purposes. Each apartments will be supplied with individual electricity supplies meters, supplying energy for all regulated and unregulated uses.

SAP Dwelling Emission Rate (DER) calculation outputs for the sample dwellings has been used to determine the space heating demand, which equates to 16.7 kWh/m^2/Year. This is just above the GLA target value of 15 kWh/m^2/Year and demonstrates that the apartments have a good thermal efficiency. The heating demand is greatly influenced by the exposed surfaces, which is relatively high with three quarters of the walls exposed and remining wall adjoining the unheated common space. The dwellings are also low rise at just three storeys, leading to the ground floor and roof exposure having a significant influence on the space heating demand.

In addition to the space heating demand, the total energy consumption has been calculated. This assessment applies the development energy consumption as calculated by SAP, but also includes unregulated energy, the energy used to mitigate overheating and lighting power consumption within common areas.

The Energy in Use (EIU) assessment does not include car charging, external lighting or any other power consumption outside of the building.

The Energy in Use rate is predicted to be 55kWh/m2/year, this comprises 27.8 kWh/m2/year for appliances and cooking within the apartments otherwise know as unregulated energy. The regulated energy quates to 27.18kW/m2/year.

9 CONCLUSIONS

Following a review of the relevant National and Local Planning Policies, this Energy Assessment proposes a strategy that positively responds to London Plan, Policies SI2, SI3, SI4 the Mayor's Energy Assessment Guidance, Haringey Local Plan (2017) SP4 and Development Management Policy DM21.

The energy efficiency measures include: good fabric insulation, high quality glazing, improved air tightness, high efficiency balanced whole house heat recovery units, and low energy lighting throughout. The energy efficiency measures are predicted to reduce the emissions by 26%

The site is within an area of opportunity for district heating. The site is also just within an area identified as DENCZ 500m, but given that the low density of the development a community heating system would lead to higher fuel costs due to the high distribution losses that would be expected over such a wide area. Therefore a community heating system is not recommended for this development.

Air source heat pumps dedicated to each dwelling will provide all the space heating and domestic hot water to the dwellings. The heat pumps are predicted to reduce the emissions by 115.3 tonnes or 45%.

A 27kWp Photovoltaic panel installation spread across the dwellings is predicted to generate 16,427kWh and reduce the CO_2 emissions by 2.0 tonnes.

The total reduction of regulated emissions, once energy efficiency measures and renewable energy is considered is 78% based on NCM building performance.

Table 12 - Total CO2 Reduction Across the Development

Development Carbon Dioxide Emissions from each stage of the Energy Hierarchy			
	Total Regulated Emissions	**CO2 Savings**	**Percentage Saving**
	(Tonnes CO2/year)	**(Tonnes CO2/year)**	**%**
Part L 2021 Baseline	33.8		
Be Lean	24.9	8.8	26
Be Clean	24.9	0.0	0
Be Green	7.6	17.4	51
Cumulative Saving		26.2	78
Total off-set		**21,634**	

The zero carbon homes CO2 offset payment is calculated to be £21,634 for the dwellings based on £95.00 / tonne over a 30 year period.

A1 APPENDIX 1 - RENEWABLE ENERGY OVERVIEW

The information in this appendix is not project specific and is intended to provide an overview of the technologies described.

A1.1 Biofuels

A1.1.1 Background

Biomass is an alternative solid fuel to the conventional fossil fuels and has an impact on carbon emissions that is close to neutral. Various types of biomass fuels are in use, the most common being the woody biomass, which includes forest residues such as tree thinnings, and energy crops such as willow short rotation coppice. The fuel usually takes the form of wood chips, logs and pellets. Supply and storage of the biomass fuel should be carefully considered especially for larger plants. Modern systems can be fed automatically by screw drives from fuel hoppers.

The typical applications are:

a. Biomass boilers replacing standard gas- or oil -fired boilers for space heating and hot water (for individual buildings or district heating systems).

b. Standalone room heaters for space heating.

c. Stoves with back boilers, supplying domestic hot water.

d. Biomass CHP for heat and electricity generation.

Appliances can achieve efficiencies of more than 80%.

The capital cost of automated biomass heating systems is significantly greater than that of conventional heating systems, mainly because of the more complicated feeding mechanisms and the currently smaller market for biomass appliances.

There is an ongoing public debate on the true sustainability of using biofuels. Given the number of differing views expressed by academics and engineers and contradictions in publications issued by the Government the theoretical carbon savings offered by biofuels must be treated with extreme caution. 3.1.2 to 3.1.5 below expands on this.

A1.1.2 Biofuels as a Sustainable Resource

Research undertaken by AEA technology on behalf of the Department for Transport stated that 'Research has shown that biofuels can reduce carbon emissions, yet they are currently a controversial area of science. Insufficient data exists to fully understand the impact of biofuel production on communities and the environment; and, whilst biofuels could be a powerful tool in reducing carbon emissions, they must be produced in a sustainable manner if they are not to do more harm than good' then states that 'biofuels are currently a controversial topic area, and it is difficult to move forward in such circumstances'. The research paper listed 4 key findings:

Key finding 1: We need to improve our understanding of the indirect impacts of biofuels, particularly indirect land use change;

Key finding 2: We need to improve our knowledge of the environmental, socioeconomic and supply-chain impacts of biofuels;

Key finding 3: There is a need for new research to examine the evolution of the production, infrastructure and vehicle technologies necessary to enable us to meet longer-term biofuels targets for transport and for improving the sustainability of biofuels;

Key finding 4: There are a number of cross-cutting research gaps that need to be addressed in order to support the development of biofuels policy

According to the Renewable Fuels Agency2 only 18% of the liquid biofuels consumed in the UK originate in the UK. 30% of liquid biofuels originates in Brazil, and the sustainability of their production and the consequent deforestation are the topic of wider debate.

[2] Renewable Fuels Agency Quarterly Report Apr 2010 to October 2010

The carbon emission factor stated in the Standard Assessment Procedure (SAP) 2009 for biodiesel is 0.047kg CO_2/kWhr. (The SAP methodology is used to calculate the energy consumption and carbon emissions from dwellings to demonstrate compliance with the Building Regulations and generate Energy Performance Certificates). Data published by the Renewable Fuels Agency3 shows that the mean carbon emission factor for biodiesel consumed in the UK is 0.148kgCO_2/kWhr (41 gCO_2e/MJ), this compares to the carbon emission factor for natural gas of 0.198kgCO_2/kWhr. Given that there is a limited supply of biofuel it would be reasonable to use the mean value for the emission factor; this principle is applied to mains electricity where the carbon emissions from all sources of electricity generation are aggregated to arrive at a mean value.

The carbon emission factor stated in the SAP 2009 for wood pellets is 0.028kg CO_2/kWhr. Research by AEA Technology on behalf of the Environment Agency4 showed that the emissions are actually between 0.050 and 0.140 kg CO_2/kWhr, with 0.1 kgCO_2/kWhr being a typical value for good practice. From this it can be concluded that the carbon savings stated when using the SAP values are overstated.

Biodiesel CHP may be technically viable for the development but the lack of certainty over the sustainability of liquid biofuels militates against this. In addition to this, concerns over the future availability of fuel supplies are a consideration. The European Renewable Energy Directive (RED) commits the UK to sourcing 10 percent of its transport energy from renewable sources by 20205. Currently only 3.5% of transport energy is from renewable sources, and 82% of this is imported. It is reasonable to conclude that as the volume of liquid biofuel that is legally required to be used for transport energy increases, the supply of the fuel for other purposes will become more expensive and difficult to procure.

A1.2 Air and Ground Source Heat Pumps

A1.2.1.1 Background

The technology makes use of the energy available in the ambient air or stored in the Earth's crust, which comes mainly from solar radiation. Essentially, heat pumps take up heat at a certain temperature and release it at a higher temperature. This is achieved by means of a simple heat exchanger in the case of air source heat pumps, or by means of either horizontal or vertical ground collectors, in which a heat exchange fluid circulates and transfers heat via a heat exchanger to the heat pump, in the case of ground source heat pumps. For the latter, when considering buildings with piled foundations, the pipes can be integrated in the design using several piling systems.

The efficiency of any type of heat pump is very much dependent on the temperature level at which it has to provide the heat: the lower the temperature level, the better the coefficient of performance.

Almost all heat pumps in operation are based on the vapour compression cycle, which combines efficiency, safety and reasonable cost. The efficiency of heat pumps is measured by the ratio of the heating capacity to the power input, referred to as the Coefficient of Performance (COP). Generally, a COP of around 2.5-3 for air source heat pumps and around 3.5-4 for ground source heat pumps is achievable for heating, assuming low temperature heat emitters such as underfloor heating. When used to generate domestic hot water at 60°C the COP falls for both types of heat pumps by around 1 point. Therefore, when it comes to domestic hot water, heat pumps can be implemented to pre-heat the water up to a certain temperature, before it enters the boiler, rather than to heat up the domestic hot water entirely up to its final required temperature.

The approximate costs for heat pumps amount to £700 per kWth heat output for an air source heat pump, and £1,200 per kWth heat output for a ground source heat pump with horizontal trenches, and £1,400 per kWth heat output for a ground source heat pump with vertical boreholes (including the cost of bore holes).

[3] Renewable Fuels Agency Quarterly Report Apr 2010 to October 2010
[4] Biomass: Carbon sink or carbon sinner?, Environment Agency, April 2009
[5] Department of Energy and Climate Change website.

A1.3 Solar Water Heating Systems

A1.3.1.1 Background

Solar thermal and, especially, active Solar Domestic Hot Water (SDHW) heating is a well - established renewable energy system in many countries outside the UK. It can be one of the most cost-effective renewable energy systems available.

It is appropriate for both residential and non-residential applications, and there are currently in the order of 80,000 installations in the UK.

Solar thermal systems in the UK normally operate with a back-up source of heat, such as gas or electricity. The solar system pre-heats the incoming cold water, which is topped up by the back-up heat source when there is insufficient solar energy to reach the chosen target temperature.

Solar collectors are best mounted at an incline with a southerly orientation, although orientations between south-east and south-west are acceptable. The panels can be fixed to the roof or walls.

There are three main types of solar collector that can be used in SDHW systems. These are:

a. Evacuated tubes.

b. Glazed selective surfaced flat plate.

c. Glazed non-selective surfaced flat plate.

Evacuated tube collectors are generally more expensive than flat plate type but offer an improved performance, particularly in the winter.

A1.4 Photovoltaics

A1.4.1.1 Background

Photovoltaic modules convert daylight directly into DC electricity and can be integrated into buildings. Photovoltaics (PVs) are distinct from other renewable energy technologies since they have no moving parts to be maintained and are silent. PV systems can be incorporated into buildings in various ways: on sloped roofs and flat roofs, in facades, atria and shading devices. Modules can be mounted using frames or they can be fully incorporated into the actual building fabric; for example, PV roof tiles are now available which can be fitted in place of standard tiles. Since PVs generate DC output, an inverter and other equipment is needed to deliver the power to a building or the grid in an acceptable AC form. The cost of the inverter and these components can approach 50% of the total cost of a PV system.

For PV to work effectively it should ideally face south and at an incline of 30º to the horizontal, although orientations within 45º of south are acceptable. It is essential that the system is unshaded, as even a small shadow may significantly reduce output.

A1.5 Wind Energy

A1.5.1.1 Background

Most wind turbines are installed in non-urban areas for environmental and technical reasons. However, it has become more common for smaller devices installed at the point of use, i.e. urban settings. The capacity of wind turbines range from 500W to more than 1.5 MW, but, for practical purposes and in built-up areas in particular, machines of more than 1 kW and below 500kW are likely to be considered. Individual building or community wind projects, although smaller, have the advantage of feeding electricity directly into the building's electricity circuit, thus sparing costly distribution network development and avoiding distribution losses. The downside is the still high capital cost per kW installed for smaller turbines, plus location constraints, such as visual intrusion and noise. The wind regime in urban areas is also a concern owing to higher wind turbulence which reduces the potential electricity output.

In most cases, wind turbines are connected to the electricity grid and all generated energy is used regardless of the building demand fluctuations. The output largely depends on the wind speed and the correlation between the two is a cube function. This means that in short periods of above-average wind speeds the generation increases exponentially. As a result, it is difficult

to make precise calculations of the annual output of a turbine, but average figures can provide useful guidance.

The cost per kW installed varies considerably by manufacturer and size of machine with an indicative bracket of £2,500-£5, 000. With a lifespan of more than 20 years, wind turbines can save money if design and planning are carried out in a robust way.

Wind Turbine Options

Wind turbines can be mounted on horizontal or vertical axes. The horizontal mounted turbines are less expensive (around £ 20,000 for a 6 kW turbine) but generate more vibrations. The vertical mounted turbines are more expensive (around £ 22,000 for a 5 kW turbine), but almost vibration free. The table below shows the most relevant figures for both types of turbines.

A2 APPENDIX 2 – WATER CALCULATOR

Approved Document G - Table A1 Water Efficiency Calculator for Dwellings

Project Ref: 210040
property Type: Lansdowne Road

Installation Type	Unit of Measure	Capacity /flow rate	Use factor	Fixed use (litres/ person/ day)	litres/ person/day
WC Single Flush	Flush Volume (litres)	0	*4.42*	*0*	0.00
WC Dual Flush	Full flush volume (litres)	6	*1.46*	*0*	8.76
	Part flush volume (litres)	4	*2.96*	*0*	11.84
WC's Multiple fittings	Average effective flushing volume (litres)	0.0	*4.42*	*0*	0.00
Taps (Excluding kitchen/utility room taps	Flow rate (litres/min)	5.0	*1.58*	*1.58*	9.48
Bath (where shower also present)	Capacity to overflow	130	*0.11*	*0*	14.30
Shower (where bath is also present)	Flow rate (litres/min)	8	*4.37*	*0*	34.96
Bath only	Capacity to overflow	0	*0.5*	*0*	0.00
Shower only	Flow rate (litres/min)	0	*5.6*	*0*	0.00
kitchen/utility sink taps	Flow rate (litres/min)	6	*0.44*	*10.36*	13.00
Washing machine	Litres/kg dgy load	9	*2.1*	*0*	18.90
Dishwasher	Litres/place setting	1	*3.6*	*0*	3.60
Waste disposal unit	Litres/use (if present=1, if absent=0)	0	*3.08*	*0*	0.00
water softener	Litre/person/day	0	*1*	*0*	0.00
	Total calculated Use				**114.84**
	Contribution from grey water (litres /person/day)				0.00
	Contribution from rain water (litres /person/day)				0.00
	Normalisation factor				0.91
	Total water consumption				104.50
	External water use				5.00
	Total water consumption				**109.50**
GLA Target incorpotating external water use - 110lts/person/day					

A3 APPENDIX 3 – OVERHEATING RISK ASSESSMENT

DWELLING OVERHEATING
RISK ASSESSMENT

FOR

LANSDOWNE ROAD
ARUNDEL AND BALDEWYNNE COURTS

VERSION 3.0

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CONTENTS

LANSDOWNE ROAD, ARUNDEL & BALDEWYNNE COURTS

OVERHEATING RISK ASSESSMENT

Clause	Description	Page No.
PROJECT REVISION SHEET		**3**
EXECUTIVE SUMMARY		**4**
1	**INTRODUCTION**	**6**
1.1	Background	6
1.2	Description of the Site and Building	6
1.3	Design Development	7
1.4	Surrounding Noise Sources	10
2	**Relevant Planning Policy**	**11**
2.1	Haringey's Key Overheating Planning Application requirements	11
3	**OVERHEATING ASSESSMENT**	**12**
3.1	Predominantly Naturally Ventilated Homes	12
3.2	Predominantly Mechanically Ventilated Homes	13
3.3	Building / Room Categories	13
3.4	Common Areas	13
3.5	Weather Files	13
3.6	Building Construction and Ventilation	14
3.7	Internal Gains	15
4	**APARTMENT RESULTS**	**16**
4.1	DSY 1 2020 – Mandatory Compliance	16
4.2	Additional Weather Files (2020's)	18
4.3	Future Compliance Files (2050's and 2080's)	20
4.4	Good Practice Future Compliance: (2050's and 2080's)	23
5	**CONCLUSION**	**27**
A1	**APPENDIX 1 – TM59 INTERNAL HEAT GAINS**	**28**
A2	**APPENDIX 2 – SAMPLE APARTMENT LOCATIONS**	**29**
A3	**APPENDIX 3 – EXAMPLE OF MVHR COOLING MODULE**	**32**
A4	**APPENDIX 4 – DRAWING REFERENCES**	**35**

PROJECT REVISION SHEET

LANSDOWNE ROAD
ARUNDEL AND BALDEWYNNE COURTS

210040

Revision . V3.0

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2.0	26/06/2023	Results amended to suit latest layouts	-	M Smith	A Sturt
3.0	05/02/2024	For planning	Revised to suit revised scheme	A Sturt	P Lindsay

EXECUTIVE SUMMARY

This Overheating Risk Assessment has been prepared by Silcock Dawson and Partners to assess the risk of dwellings overheating at the proposed new development at Lansdowne Road.

Dynamic thermal modelling has been undertaken in accordance with the recommendations of CIBSE Technical Memoranda 59, Design Methodology for the Assessment of Overheating Risk in Homes and Approved Document Part O.

The acoustic survey conducted by Acoustic Consultants ltd has identified that all apartments are exposed to ambient noise above the levels recommended within the Acoustic Ventilation and Overheating Residential Design Guide (2020), which suggests that openable windows should not be the sole means to mitigate against the risk of overheating.

As this has been modelled to affect all dwellings, each shall have a mechanical peak lop cooling system installed to prevent the overheating criteria being exceeded when assessed as predominantly mechanically ventilated.

To ensure all dwellings have the facility to maintain comfort conditions should the residents choose to rely on opening the windows all dwellings are first assessed as predominantly naturally ventilated.

The assessment is based on 24 sample apartments to address the different apartment types, this also includes a sample of predominantly mechanically ventilated apartments to demonstrate that the peak lop cooling capacity is sufficient to meet the overheating criteria with the windows remaining in the closed position.

The principle ventilation and construction details are outlined below.

Item	Dwellings Construction
Window Properties	Window U value: 1.3 W/m^{2}K Glazing G value: 0.4
External wall construction	Brick, cavity, block construction with partial insulation within the cavity and plasterboard on the inner surface.
Party wall construction	25mm Plasterboard, cavity, insulation, 25mm plasterboard.
Internal wall construction	Plasterboard stud walls with 15mm plasterboard both sides
Intermediate floor construction	Plasterboard ceiling, air gap, concrete/screed, and carpet finish.
Background Mechanical Ventilation	Background ventilation rate in accordance with Approved Document Part F (0.3 l/s/m2 or approximately 0.4 air changes by MVHR with summer bypass).
Infiltration	0.25 air changes per hour
Lounge Windows	Windows open when lounge is occupied. Windows start to open when the internal room temperature reaches 22° C and are fully open at 26° C.
Bedroom Windows	Windows start to open when the internal room temperature crosses 22° C and are fully open at 26° C.
Internal Doors	Internal doors will be held fully open outside of sleeping hours to promote cross flow ventilation.
Balcony Doors- Lounges	Doors open when lounge is occupied. Windows start to open when the internal room temperature reaches 22° C and are fully open at 26° C and shut overnight.
Ground Floor openings	Bedroom windows start to open when the internal room temperature crosses 22° C and are fully open at 26° C. The windows are simulated closed overnight, to maintain security in accordance with AD Part O.

Boost ventilation rates if applicable	A higher ventilation rate is simulated to active when the air temperature reaches 23°C followed by the cooling module if temperatures continue to rise.
Cooling duty if applicable	Low-capacity cooling modules (upto 0.85kW) are incorporated within the MVHR system

The CIBSE weather file for the London Weather Centre was selected at the most appropriate location for the site. In accordance with the guidance within TM59, Design Summer Year (DSY)1 – 2020, High 50th Percentile has been used for the primary assessment.

Summary results for apartments assessed as Predominantly Naturally Ventilated

Number of Lounges / Kitchens assessed	**Number compliant with Criteria 1**
24	24

Number of Bedrooms	**Number compliant with**	
	Criteria 1	**Criteria 2**
42	42	11

The apartment bedrooms that fail Criterion 2, are located at ground floor level, and remain closed overnight to maintain security within the apartments. If the security measures are not considered the all sample dwellings would comply with AD Part O.

The apartments are also assessed as predominantly mechanically ventilated due to traffic noise levels and to maintain secure ground floor dwellings.

Summary results for apartments assessed as Predominantly Mechanically Ventilated

Number of Lounges / Kitchens assessed	**Compliant**
24	42

Number of Bedrooms	**Compliant**
42	42

The development does not include a communal heating system, therefore it is not necessary to simulate the conditions within the common areas.

1 INTRODUCTION

1.1 Background

This Overheating Risk Assessment has been prepared by Silcock Dawson and Partners to assess the risk of dwellings overheating at the proposed new development at Lansdowne Road.

The aim of this report is to document the findings of thermal modelling that has been undertaken to quantify the overheating risk within the dwellings. Modelling has been undertaken in accordance with the criteria set out in CIBSE Technical Memoranda 59 Design Methodology for the Assessment of Overheating Risk in Homes (2017)

1.2 Description of the Site and Building

Arundel Court

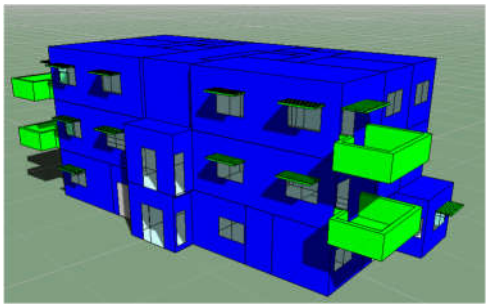
The proposal is to demolish the garages and remove the parking area to the Lansdowne Road frontage and provide a mix of new homes. The proposal provides three new apartment buildings which are three storeys in height. The ground floor apartments comprise of 1 bedroom and wheelchair dwellings, all with their own front doors. The buildings are walk up blocks serving 2 x two bedroom apartments per floor.

Baldewyne Court

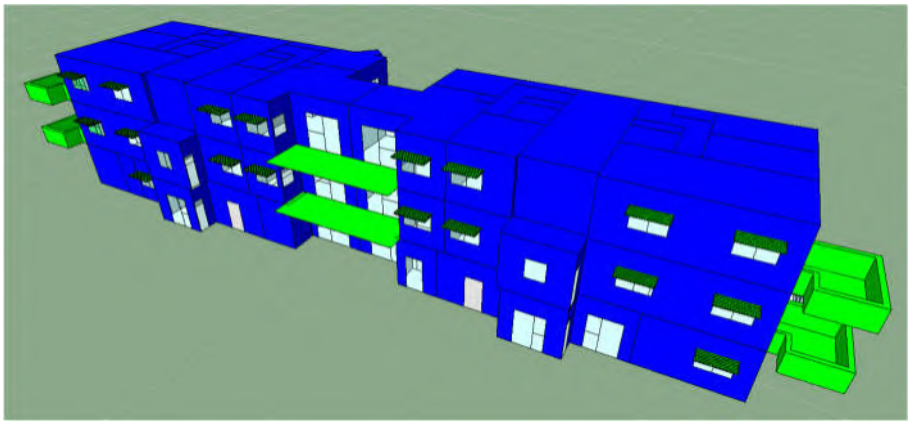
The proposal is to demolish the garages and remove the parking area to the Lansdowne Road frontage and provide a mix of new homes. The proposal provides two new apartment buildings which are three storeys in height. The ground floor apartments comprise of 1 bedroom and wheelchair dwellings, all with their own front doors. The buildings are walk up blocks serving 2 x two bedroom apartments per floor

The images below indicate the sample apartments included within the simulation.

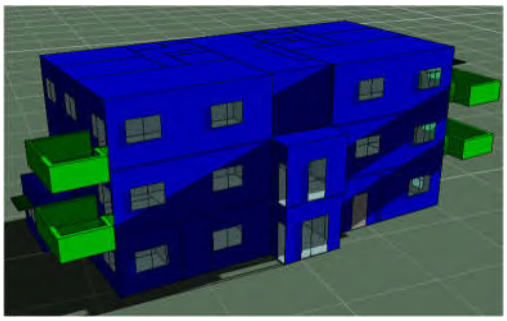
Block A



Blocks B and C



Block E



1.3 Design Development

Measures have been incorporated within the design of the apartments to minimise solar gains and increase potential ventilation rates.

This section details how the design has evolved, the images below only cover a sample section of the façade and are used to illustrate the design changes implemented across the site.

1.3.1 Initial Elevation Details

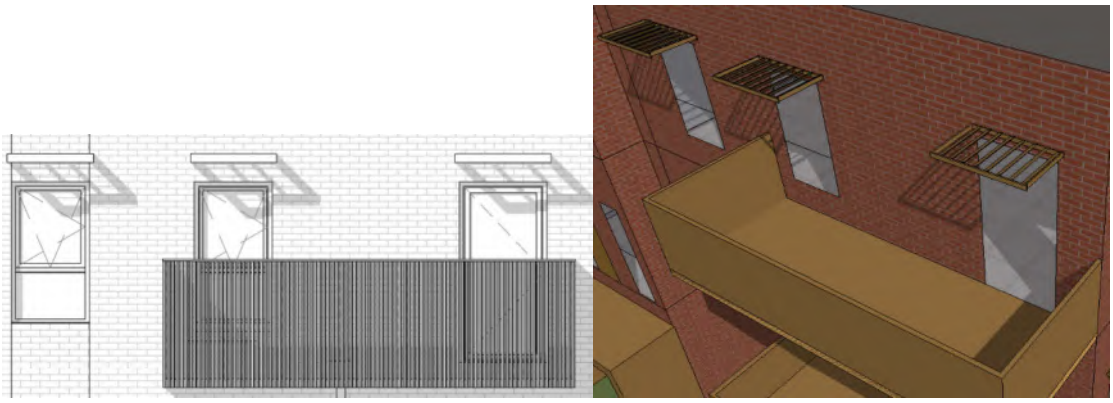
Part Elevation Block B

The initial design showed double windows without any shading devices as illustrated in the image above.

1.3.2 Development 1- Reduce Glazing proportion

At this stage, glazing levels were reviewed and reduced as shown above. All windows apart from the fixed lower-level glazing were assigned to open fully inwards to maximise the available ventilation. These changes improved the conditions within majority of the apartments, but a small number of bedrooms and lounges were still found to exceed the overheating criteria.

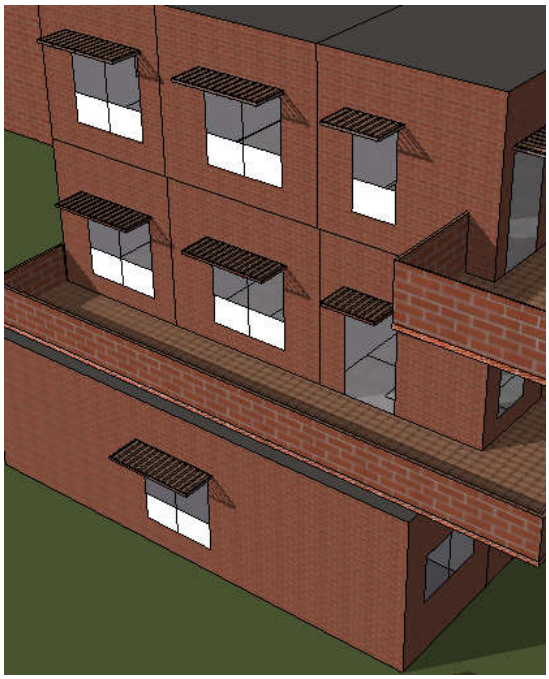
1.3.3 Development 2- Introduction of Shades



A further review was undertaken to allieviate the risk of overheating and shades were added above the windows to reduce the direct solar irradiance impacting on the windows.

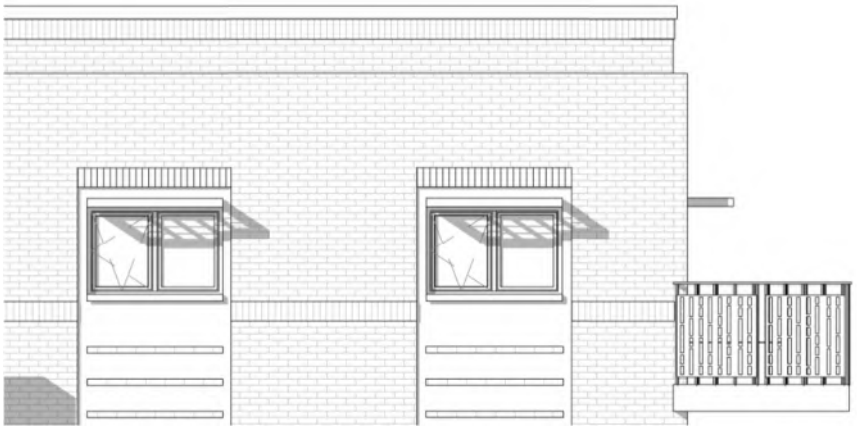
1.3.4 Development 3- Introduction of Low level spandrel Panels

A further review was undertaken to minimise solar gain to rooms facing west and east where a number of rooms were failing at the time by replacing low level glazing with spandrel panels.



1.3.5 Development 4- Replace Spandrel panels with wall construction.

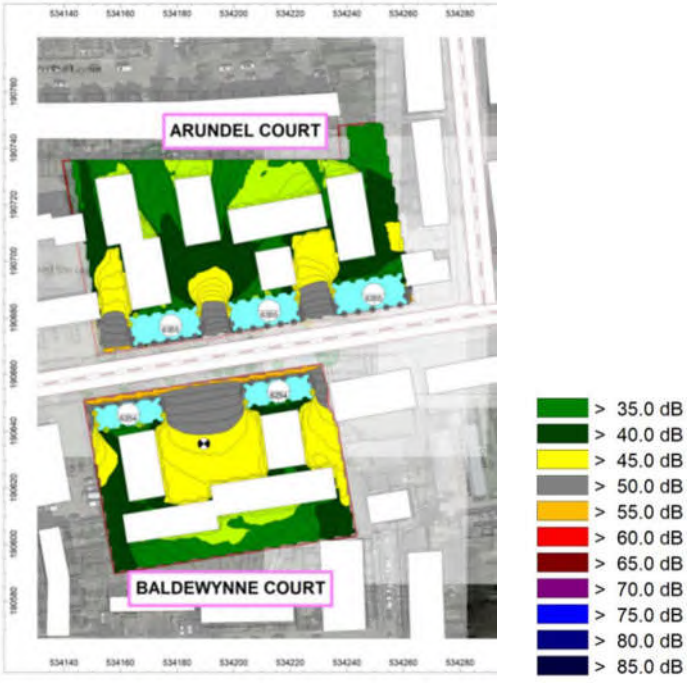
To further improve the thermal mass, the design was further ammended to exchange the spandrel panels for external wall section.



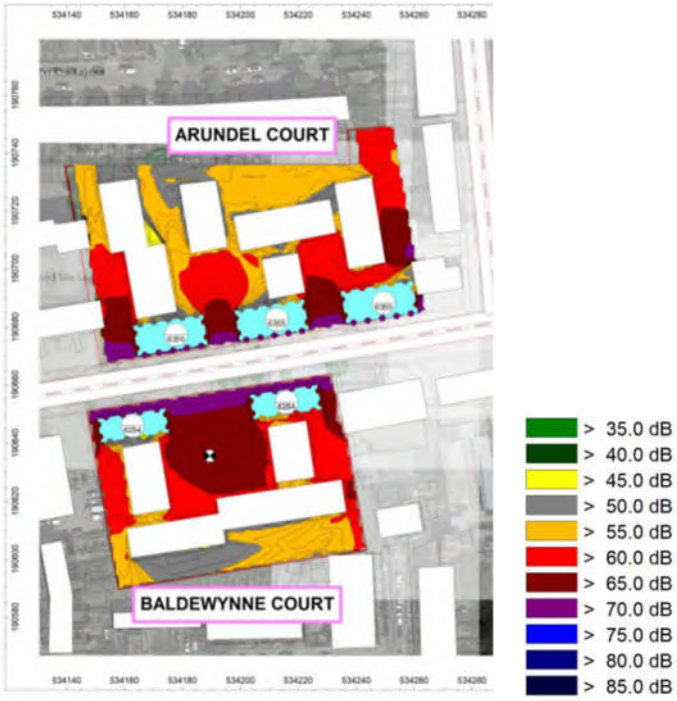
1.4 Surrounding Noise Sources

The site is subject to noise from Lansdowne Road, and the attached extract from the Environmental Noise Assessment illustrates the projected ambient noise levels on the building facades.

Daytime L_{aeq}



Night time L_{eaq}



Night time L_{max}

2 Relevant Planning Policy

2.1 Haringey's Key Overheating Planning Application requirements

Overheating assessments should be undertaken for any buildings where people spend a significant amount of time, and developments of these types should comply with these requirements policy, including:

- Prisons and other buildings such as immigration detention centres where people are not permitted to leave
- Offices
- Schools, nurseries and any other educational facilities
- Care homes, sheltered housing and assisted living facilities
- Healthcare facilities
- Temporary residential accommodation
- Student and co-living accommodation
- Warehouse living
- All buildings where vulnerable people are accommodated

Habitable rooms in which people will be sleeping must be modelled in line with the CIBSE TM59 requirements. Any communal areas or other types of habitable rooms spaces that are not classified as Use Class C3 Residential Dwellings must be modelled under the CIBSE TM52 requirements.

3 OVERHEATING ASSESSMENT

3.1 Predominantly Naturally Ventilated Homes

This overheating assessment is based on the adaptive comfort model following the methodology and recommendations from EN 15251, and modelling has been undertaken following the procedure set out in CIBSE TM59.

The thermal modelling has been carried out using IES Virtual Environment software. This modelling software is approved by 2021 Building Regulations and is also compliant with CIBSE AM11 requirements.

For naturally ventilated dwellings TM59 tests two criteria to assess overheating risk. One of which is defined in terms of the difference between the actual operative temperature in the room at any time (T_{op}) and the limiting maximum acceptable temperature (T_{max}). The difference between these temperature values is the 'delta T' (ΔT).

The second applies just to bedrooms to provide a limiting temperature when sleep patterns may be affected.

DEFINITIONS

Operative Temperature

T_{OP} = 0.5 T_{air} (AirTemp) + 0.5 T_{mrt} (Mean Radiant Temp)

Maximum acceptable temperature

TMAX = 0.33Trm + 21.8

Where:

Running Mean Temperature, Trm, is the running average of recent external temperatures. The running mean is calculated using a complicated equation that weights the significance of external temperatures according how recently they occurred. This weighting gives a greater influence for recent days, reducing with time passed as people "forget".

Criterion 1 – Hours of Exceedance (He): The number of hours that the actual operative temperature in the room (Top) exceeds the limiting maximum acceptable temperature (Tmax) by one degree (K) or more, must be less than 3% of the summer occupied hours, May to September. The maximum number of hours exceeding for Lounges and Kitchens is 59, however as bedrooms are assumed to be continuously occupied this increases to 110 for these spaces.

This criterion provides an understanding of how often a room is likely to exceed its comfort range and can provides a good assessment of acceptability.

Criterion 2 - Frequency Assessment (Bedrooms and Studios only)

In addition to the adaptive comfort a second test is also carried out for bedrooms to provide an assessment of comfort during the sleeping hours. The operative temperature in bedrooms from 22:00 to 07:00 shall not exceed 26°C for more than 1% (33 hours) of the occupied hours annually.

Bedrooms must comply with Criterion 1 and 2 for the room to comply

3.2 Predominantly Mechanically Ventilated Homes

For dwellings with restricted window openings including windows that should not open due to high external noise levels, the CIBSE fixed temperature test must be followed.

DEFINITIONS

Operative Temperature

T_{OP} = 0.5 T_{air} (AirTemp) + 0.5 T_{mrt} (Mean Radiant Temp)

Maximum acceptable temperature

TMAX = 26°C

Criterion 1 – Frequency Assessment

All occupied rooms should not exceed 26°C for more than 3% of the annual occupied hours.

3.3 Building / Room Categories

TM59 suggests four categories of performance under which buildings should be assessed. The CIBSE suggestion is that designers should aim to remain within the Category II limits for buildings not used by groups that may be adversely affected by warmer environments.

Category	Explanation	Suggested acceptable range (K)
I	High level of expectation only used for spaces occupied by very sensitive and fragile persons	± 2
II	Normal expectation (for new buildings and renovations)	± 3
III	A moderate expectation (used for existing buildings)	± 4
IV	Values outside the criteria for the above categories (only acceptable for a limited periods)	>4

For the purposes of this study all rooms are assessed as Category II.

3.4 Common Areas

The common areas are not assessed as there is not community heating system on site.

3.5 Weather Files

The 'London Weather Centre' weather file has been selected as the most representative from the data base, due to the outer London location of the development. The exact weather file for the assessment is London_LWC_DSY1_2020 High 50 in accordance with the recommendations within TM59.

Additional simulations are included as detailed within the planning application overheating requirements and all simulations use weather data sets High 50th percentile.

3.6 Building Construction and Ventilation

Item	Dwellings Construction
Window Properties	Window U value: 0.9 W/m^{2}K Glazing G value: 0.4
External wall construction	Brick, cavity, block construction with partial insulation within the cavity and plasterboard on the inner surface.
Party wall construction	25mm Plasterboard, cavity, insulation, 25mm plasterboard.
Internal wall construction	Plasterboard stud walls with 15mm plasterboard both sides
Intermediate floor construction	Plasterboard ceiling, air gap, concrete/screed, and carpet finish.

The following table summarises the baseline building model assumption with regards to providing a predominantly naturally ventilated building scenario.

Item	Ventilation
Background Mechanical Ventilation	Background ventilation rate in accordance with Approved Document Part F (0.3 l/s/m2 or approximately 0.4 air changes by MVHR with summer bypass including room containing heat interface unit or hot water cylinder).
Infiltration	0.25 air changes per hour
Lounge Windows	Windows open when lounge is occupied. Windows start to open when the internal room temperature reaches 22° C and are fully open at 26 ° C. Windows are generally of the Tilt and Turn type and fully open is simulated as inward fully open.
Internal Doors	Internal doors will be held fully open outside of sleeping hours to promote cross flow ventilation.
Balcony Doors- Lounges	Doors open when lounge is occupied. Doors start to open when the internal room temperature reaches 22° C and are fully open at 26 ° C and shut overnight.
Balcony Doors- Bedroom	Doors open when lounge is occupied. Windows start to open when the internal room temperature reaches 22° C and are fully open at 26 ° C and shut overnight.

Predominantly Mechanically Ventilated Apartments

The MVHR units are proposed to be supplied with additional Peak Lop cooling modules that are mounted on top of the MVHR units. The available cooling duty is relatively small and the units do not provide full air conditioning. Their purpose is to just limit the number of hours when high temperatures are experienced.

At room temperatures above 23°C the MVHR is simulated to run at a higher rate as indicated below, and cooling modules enabled.

Background Mechanical Ventilation	Background ventilation rate in accordance with Approved Document Part F (0.3 l/s/m^2)
Bedroom increased Ventilation	1 bed bedroom 16 l/s, 2 bed bedroom 15 l/s
Living/Kitchen/Dining increased ventilation	1 bed LKD 44 l/s 2 bed LKD 55l/s

The effect of the cooling modules is simulated based on varying internal and external air temperatures, against recorded supply temperatures under test conditions.

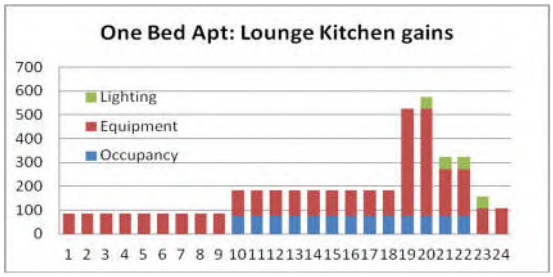
As an example the cooling output from the refrigerant section and heat exchanger combined at 29°C external and 26°C internal air temperatures for the different apartment types is as follows.

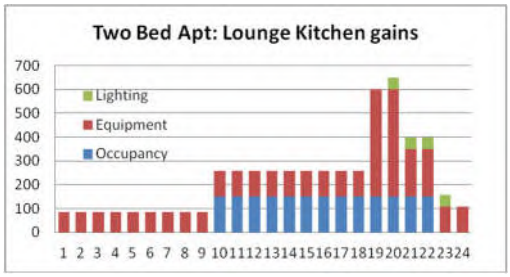
1 Bed 0.6kW

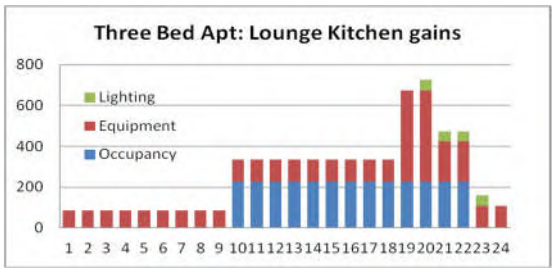
2 Bed 0.85kW

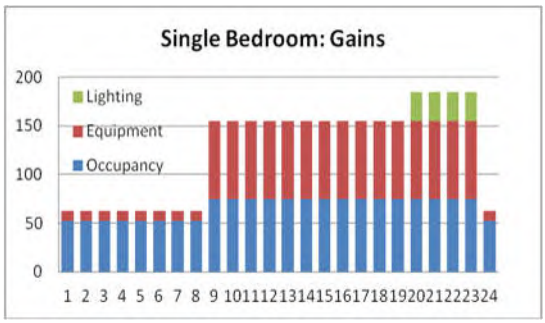
3.7 Internal Gains

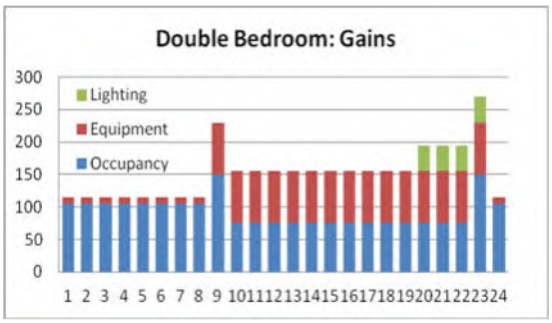
The following graphs show the internal heat gains for the dwellings and the times at which the gains are present as detailed within TM59.











Lounge heat gains also include heat gains from cooking which are applied from 18:00 to 20:00 the back ground equipment gains are from the refrigerator and other equipment left on standby.

It should be noted that bedooms are simulated as continuously occupied, this is intended to reflect the possibility that these rooms could be used as home offices, study areas during the day, or by persons that are confined to the bedrooms for extended periods of time.

A full breakdown of internal gains is contained in Appendix 1.

4 APARTMENT RESULTS

4.1 DSY 1 2020 – Mandatory Compliance

4.1.1 Natural Ventilation

Room Ref	Criterion 1: Max = 3%			Criterion 2: Max 1% (32H)			Overall Result
	No. and % hours >1K above tmax			No. and % hours > 26°C			
A-00-P1-2B3P-Bedroom 1 DB	27	0.7%	Pass	103	3.1%	Fail	Fail
A-00-P1-2B3P-Bedsroom 2 DB	38	1.0%	Pass	233	7.1%	Fail	Fail
A-00-P1-2B3P-LKD	26	1.31%	Pass	NA	NA	NA	Pass
A-00-P2-1B2P-Bedroom	26	0.7%	Pass	120	3.7%	Fail	Fail
A-00-P2-1B2P-LKD	26	1.3%	Pass	NA	NA	NA	Pass
A-01-P3-2B4P-Bedroom 1 DB	26	0.7%	Pass	17	0.5%	Pass	Pass
A-01-P3-2B4P-Bedroom 2 DB	30	0.8%	Pass	30	0.91%	Pass	Pass
A-01-P3-2B4P-LKD	25	1.3%	Pass	NA	NA	NA	Pass
A-01-P4-2B4P-Bedroom 1 DB	26	0.7%	Pass	17	0.5%	Pass	Pass
A-01-P4-2B4P-Bedroom 2 DB	27	0.7%	Pass	28	0.9%	Pass	Pass
A-01-P4-2B4P-LKD	24	1.2%	Pass	NA	NA	NA	Pass
A-02-P5-2B4P-Bedroom 1 DB	25	0.7%	Pass	17	0.5%	Pass	Pass
A-02-P5-2B4P-Bedroom 2 DB	27	0.7%	Pass	28	0.85%	Pass	Pass
A-02-P5-2B4P-LKD	23	1.2%	Pass	NA	NA	NA	Pass
A-02-P6-2B4P-Bedroom 1 DB	26	0.7%	Pass	17	0.5%	Pass	Pass
A-02-P6-2B4P-Bedroom 2 DB	27	0.7%	Pass	28	0.9%	Pass	Pass
A-02-P6-2B4P-LKD	24	1.2%	Pass	NA	NA	NA	Pass

Room Ref	Criterion 1: Max = 3%			Criterion 2: Max 1% (32H)			Overall Result
	No. and % hours >1K above tmax			No. and % hours > 26°C			
BC-00-P1-2B3P-Bedroom 1 DB	27	0.7%	Pass	89	2.7%	Fail	Fail
BC-00-P1-2B3P-Bedroom 2 SB	24	0.7%	Pass	107	3.3%	Fail	Fail
BC-00-P1-2B3P-LKD	24	1.21%	Pass	NA	NA	NA	Pass
BC-00-P2-1B2P-Bedroom DB	25	0.7%	Pass	85	2.6%	Fail	Fail
BC-00-P2-1B2P-LKD	29	1.5%	Pass	NA	NA	NA	Pass
BC-00-P3-1B2P-Bedroom DB	27	0.7%	Pass	85	2.6%	Fail	Fail
BC-00-P3-1B2P-LKD	29	1.5%	Pass	NA	NA	NA	Pass
BC-00-P4-1B2P-Bedroom	34	0.9%	Pass	104	3.2%	Fail	Fail
BC-00-P4-1B2P-LKD	30	1.5%	Pass	NA	NA	NA	Pass
BC-01-P6-2B4P-Bedroom 1 D	27	0.7%	Pass	20	0.6%	Pass	Pass
BC-01-P6-2B4P-Bedroom 2 D	24	0.7%	Pass	29	0.9%	Pass	Pass
BC-01-P6-2B4P-KLD	29	1.5%	Pass	NA	NA	NA	Pass
BC-01-P07-2B4P-Bedroom 1 D	28	0.8%	Pass	29	0.88%	Pass	Pass
BC-01-P07-2B4P-Bedroom 2 D	25	0.7%	Pass	30	0.9%	Pass	Pass
BC-01-P07-2B4P-LKD	28	1.4%	Pass	NA	NA	NA	Pass
BC-01-P08 2B4P-Bedroom 1 D	29	0.8%	Pass	17	0.5%	Pass	Pass
BC-01-P08 2B4P-Bedroom 2 D	27	0.7%	Pass	28	0.9%	Pass	Pass
BC-01-P08 2B4P-LKD	27	1.4%	Pass	NA	NA	NA	Pass
BC-02-P10-2B4P-Bedroom 1 D	28	0.8%	Pass	20	0.6%	Pass	Pass
BC-02-P10-2B4P-Bedroom 2 D	22	0.6%	Pass	30	0.9%	Pass	Pass
BC-02-P10-2B4P-LKD	30	1.5%	Pass	NA	NA	NA	Pass
BC-02-P11-2B4P-Bedroom 1 D	27	0.7%	Pass	28	0.9%	Pass	Pass
BC-02-P11-2B4P-Bedroom 2 D	24	0.7%	Pass	31	0.9%	Pass	Pass
BC-02-P11-2B4P-LKD	33	1.7%	Pass	NA	NA	NA	Pass
BC-02-P12 2B4P-Bedroom 1 D	29	0.8%	Pass	17	0.5%	Pass	Pass
BC-02-P12 2B4P-Bedroom 2 D	27	0.7%	Pass	26	0.8%	Pass	Pass
BC-02-P12 2B4P-LKD	26	1.3%	Pass	NA	NA	NA	Pass
BC-01-P5-2B4P-Bedroom 1 DB	25	0.7%	Pass	17	0.5%	Pass	Pass
BC-01-P5-2B4P-Bedroom 2 DB	27	0.7%	Pass	27	0.8%	Pass	Pass
BC-01-P5-2B4P-LKD	25	1.3%	Pass	NA	NA	NA	Pass
BC-02-P5-2B4P-Bedroom 1 DB	25	0.7%	Pass	15	0.5%	Pass	Pass
BC-02-P5-2B4P-Bedroom 2 DB	27	0.7%	Pass	26	0.8%	Pass	Pass
BC-02-P5-2B4P-LKD	22	1.1%	Pass	NA	NA	NA	Pass

Room Ref	Criterion 1: Max = 3%			Criterion 2: Max 1% (32H)			Overall Result
	No. and % hours >1K above tmax			No. and % hours > 26°C			
E-00-P1-1B2P-Bedroom DB	41	1.1%	Pass	163	5.0%	Fail	Fail
E-00-P1-1B2P-LKD	24	1.2%	Pass	NA	NA	NA	Pass
E-00-P2-2B3P-Bedroom 1 DB	21	0.57%	Pass	125	3.8%	Fail	Fail
E-00-P2-2B3P-Bedroom 2 SB	33	0.9%	Pass	136	4.1%	Fail	Fail
E-00-P2-2B3P-LKD	26	1.3%	Pass	NA	NA	NA	Pass
E-01-P3-2B4P-Bedroom 1 DB	22	0.6%	Pass	18	0.5%	Pass	Pass
E-01-P3-2B4P-Bedroom 2 DB	26	0.7%	Pass	29	0.88%	Pass	Pass
E-01-P3-2B4P-LKD	27	1.4%	Pass	NA	NA	NA	Pass
E-01-P4-2B4P-Bedroom 1 DB	24	0.7%	Pass	14	0.4%	Pass	Pass
E-01-P4-2B4P-Bedroom 2 DB	27	0.7%	Pass	29	0.9%	Pass	Pass
E-01-P4-2B4P-LKD	28	1.4%	Pass	NA	NA	NA	Pass
E-02-P5-2B4P-Bedroom 1 DB	21	0.6%	Pass	18	0.5%	Pass	Pass
E-02-P5-2B4P-Bedroom 2 DB	25	0.7%	Pass	28	0.85%	Pass	Pass
E-02-P5-2B4P-LKD	26	1.3%	Pass	NA	NA	NA	Pass
E-02-P6-2B4P-Bedroom 1 DB	22	0.6%	Pass	14	0.4%	Pass	Pass
E-02-P6-2B4P-Bedroom 2 DB	27	0.7%	Pass	28	0.9%	Pass	Pass
E-02-P6-2B4P-LKD	26	1.3%	Pass	NA	NA	NA	Pass

The results above demonstrate that the dwellings comply with Part O, fully naturally ventilated. The apartments failing Criterion 2 are located on the ground floor and the failures occur due to the need to keep he windows closed during the night due to security reasons described in Approved Document Part L

4.1.2 Mechanical Ventilation

Room Ref	Annual Occupied Hours	Max Exceedable Hours	Hours >26°C	Result
A-00-P1-2B3P-Bedroom 1 DB	8760	263	159	Pass
A-00-P1-2B3P-Bedsroom 2 DB	8760	263	79	Pass
A-00-P1-2B3P-LKD	4745	142	44	Pass
A-00-P2-1B2P-Bedroom	8760	263	190	Pass
A-00-P2-1B2P-LKD	4745	142	68	Pass
A-01-P3-2B4P-Bedroom 1 DB	8760	263	254	Pass
A-01-P3-2B4P-Bedroom 2 DB	8760	263	219	Pass
A-01-P3-2B4P-LKD	4745	142	40	Pass
A-01-P4-2B4P-Bedroom 1 DB	8760	263	199	Pass
A-01-P4-2B4P-Bedroom 2 DB	8760	263	131	Pass
A-01-P4-2B4P-LKD	4745	142	11	Pass
A-02-P3-2B4P-Bedroom 1 DB	8760	263	188	Pass
A-02-P3-2B4P-Bedroom 2 DB	8760	263	132	Pass
A-02-P5-2B4P-LKD	4745	142	21	Pass
A-02-P4-2B4P-Bedroom 1 DB	8760	263	249	Pass
A-02-P4-2B4P-Bedroom 2 DB	8760	263	154	Pass
A-02-P6-2B4P-LKD	4745	142	17	Pass

Room Ref	Annual Occupied Hours	Max Exceedable Hours	Hours >26°C	Result
BC-00-P1-2B3P-Bedroom 1 DB	8760	263	147	Pass
BC-00-P1-2B3P-Bedroom 2 SB	8760	263	7	Pass
BC-00-P1-2B3P-LKD	4745	142	15	Pass
BC-00-P2-1B2P-Bedroom DB	8760	263	36	Pass
BC-00-P2-1B2P-LKD	4745	142	17	Pass
BC-00-P3-1B2P-Bedroom DB	8760	263	65	Pass
BC-00-P3-1B2P-LKD	4745	142	30	Pass
BC-00-P4-1B2P-Bedroom	8760	263	56	Pass
BC-00-P4-1B2P-LKD	4745	142	55	Pass
BC-01-P5-2B4P-Bedroom 1 DB	8760	263	57	Pass
BC-01-P5-2B4P-Bedroom 2 DB	8760	263	30	Pass
BC-01-P5-2B4P-LKD	4745	142	1	Pass
BC-01-P6-2B4P-Bedroom 1 D	8760	263	62	Pass
BC-01-P6-2B4P-Bedroom 2 D	8760	263	75	Pass
BC-01-P6-2B4P-KLD	4745	142	15	Pass
BC-01-P07-2B4P-Bedroom 1 D	8760	263	56	Pass
BC-01-P07-2B4P-Bedroom 2 D	8760	263	78	Pass
BC-01-P07-2B4P-LKD	4745	142	15	Pass
BC-01-P08 2B4P-Bedroom 1 D	8760	263	115	Pass
BC-01-P08 2B4P-Bedroom 2 D	8760	263	87	Pass
BC-01-P08 2B4P-LKD	4745	142	16	Pass
BC-02-P5-2B4P-Bedroom 1 DB	8760	263	64	Pass
BC-02-P5-2B4P-Bedroom 2 DB	8760	263	31	Pass
BC-02-P5-2B4P-LKD	4745	142	1	Pass
BC-02-P10-2B4P-Bedroom 1 D	8760	263	105	Pass
BC-02-P10-2B4P-Bedroom 2 D	8760	263	86	Pass
BC-02-P10-2B4P-LKD	4745	142	50	Pass
BC-02-P11-2B4P-Bedroom 1 D	8760	263	75	Pass
BC-02-P11-2B4P-Bedroom 2 D	8760	263	84	Pass
BC-02-P11-2B4P-LKD	4745	142	49	Pass
BC-02-P12 2B4P-Bedroom 1 D	8760	263	136	Pass
BC-02-P12 2B4P-Bedroom 2 D	8760	263	101	Pass
BC-02-P12 2B4P-LKD	4745	142	21	Pass

Room Ref	Annual Occupied Hours	Max Exceedable Hours	Hours >26°C	Result
E-00-P1-1B2P-Bedroom DB	8760	263	24	Pass
E-00-P1-1B2P-LKD	4745	142	0	Pass
E-00-P2-2B3P-Bedroom 1 DB	8760	263	10	Pass
E-00-P2-2B3P-Bedroom 2 SB	8760	263	35	Pass
E-00-P2-2B3P-LKD	4745	142	0	Pass
E-01-P3-2B4P-Bedroom 1 DB	8760	263	7	Pass
E-01-P3-2B4P-Bedroom 2 DB	8760	263	4	Pass
E-01-P3-2B4P-LKD	4745	142	3	Pass
E-01-P4-2B4P-Bedroom 1 DB	8760	263	107	Pass
E-01-P4-2B4P-Bedroom 2 DB	8760	263	71	Pass
E-01-P4-2B4P-LKD	4745	142	2	Pass
E-02-P5-2B4P-Bedroom 1 DB	8760	263	33	Pass
E-02-P5-2B4P-Bedroom 2 DB	8760	263	7	Pass
E-02-P5-2B4P-LKD	4745	142	1	Pass
E-02-P6-2B4P-Bedroom 1 DB	8760	263	134	Pass
E-02-P6-2B4P-Bedroom 2 DB	8760	263	95	Pass
E-02-P6-2B4P-LKD	4745	142	4	Pass

The noise impact assessment advises that the windows should remain in the closed position to prevent noise disturbance. It is therefore necessary to install enhanced mechanical ventilation with peak lop cooling to achieve compliant conditions. This also has the effect of achieving compliance within the ground floor apartments. All apartments meet the Mandatory compliance standard set out in Haringey's Key Overheating Planning Application Requirements.

4.2 Additional Weather Files (2020's)

4.2.1 Mechanical Ventilation DSY 2

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
A-00-P1-2B3P-Bedroom 1 DB	8760	263	319	3.6%	Fail
A-00-P1-2B3P-Bedsroom 2 DB	8760	263	164	1.9%	Pass
A-00-P1-2B3P-LKD	4745	142	86	1.8%	Pass
A-00-P2-1B2P-Bedroom	8760	263	292	3.3%	Fail
A-00-P2-1B2P-LKD	4745	142	105	2.2%	Pass
A-01-P3-2B4P-Bedroom 1 DB	8760	263	334	3.8%	Fail
A-01-P3-2B4P-Bedroom 2 DB	8760	263	290	3.3%	Fail
A-01-P3-2B4P-LKD	4745	142	97	2.0%	Pass
A-01-P4-2B4P-Bedroom 1 DB	8760	263	369	4.2%	Fail
A-01-P4-2B4P-Bedroom 2 DB	8760	263	251	2.9%	Pass
A-01-P4-2B4P-LKD	4745	142	76	1.6%	Pass
A-02-P5-2B4P-Bedroom 1 DB	8760	263	290	3.3%	Fail
A-02-P5-2B4P-Bedroom 2 DB	8760	263	225	2.6%	Pass
A-02-P5-2B4P-LKD	4745	142	89	1.9%	Pass
A-02-P6-2B4P-Bedroom 1 DB	8760	263	426	4.9%	Fail
A-02-P6-2B4P-Bedroom 2 DB	8760	263	290	3.3%	Fail
A-02-P6-2B4P-LKD	4745	142	87	1.8%	Pass

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
BC-00-P1-2B3P-Bedroom 1 DB	8760	263	218	2.5%	Pass
BC-00-P1-2B3P-Bedroom 2 SB	8760	263	59	0.7%	Pass
BC-00-P1-2B3P-LKD	4745	142	63	1.3%	Pass
BC-00-P2-1B2P-Bedroom DB	8760	263	116	1.3%	Pass
BC-00-P2-1B2P-LKD	4745	142	68	1.4%	Pass
BC-00-P3-1B2P-Bedroom DB	8760	263	160	1.8%	Pass
BC-00-P3-1B2P-LKD	4745	142	87	1.8%	Pass
BC-00-P4-1B2P-Bedroom	8760	263	163	1.9%	Pass
BC-00-P4-1B2P-LKD	4745	142	123	2.6%	Pass
BC-01-P5-2B4P-Bedroom 1 DB	8760	263	160	1.8%	Pass
BC-01-P5-2B4P-Bedroom 2 DB	8760	263	114	1.3%	Pass
BC-01-P5-2B4P-LKD	4745	142	37	0.8%	Pass
BC-01-P6-2B4P-Bedroom 1 D	8760	263	162	1.8%	Pass
BC-01-P6-2B4P-Bedroom 2 D	8760	263	175	2.0%	Pass
BC-01-P6-2B4P-KLD	4745	142	73	1.5%	Pass
BC-01-P07-2B4P-Bedroom 1 D	8760	263	158	1.8%	Pass
BC-01-P07-2B4P-Bedroom 2 D	8760	263	184	2.1%	Pass
BC-01-P07-2B4P-LKD	4745	142	77	1.6%	Pass
BC-01-P08 2B4P-Bedroom 1 D	8760	263	260	3.0%	Pass
BC-01-P08 2B4P-Bedroom 2 D	8760	263	206	2.4%	Pass
BC-01-P08 2B4P-LKD	4745	142	81	1.7%	Pass
BC-02-P5-2B4P-Bedroom 1 DB	8760	263	167	1.9%	Pass
BC-02-P5-2B4P-Bedroom 2 DB	8760	263	132	1.5%	Pass
BC-02-P5-2B4P-LKD	4745	142	44	0.9%	Pass
BC-02-P10-2B4P-Bedroom 1 D	8760	263	218	2.5%	Pass
BC-02-P10-2B4P-Bedroom 2 D	8760	263	189	2.2%	Pass
BC-02-P10-2B4P-LKD	4745	142	129	2.7%	Pass
BC-02-P11-2B4P-Bedroom 1 D	8760	263	181	2.1%	Pass
BC-02-P11-2B4P-Bedroom 2 D	8760	263	191	2.2%	Pass
BC-02-P11-2B4P-LKD	4745	142	135	2.8%	Pass
BC-02-P12 2B4P-Bedroom 1 D	8760	263	299	3.4%	Fail
BC-02-P12 2B4P-Bedroom 2 D	8760	263	220	2.5%	Pass
BC-02-P12 2B4P-LKD	4745	142	82	1.7%	Pass

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
E-00-P1-1B2P-Bedroom DB	8760	263	327	3.7%	Fail
E-00-P1-1B2P-LKD	4745	142	99	2.1%	Pass
E-00-P2-2B3P-Bedroom 1 DB	8760	263	234	2.7%	Pass
E-00-P2-2B3P-Bedroom 2 SB	8760	263	240	2.7%	Pass
E-00-P2-2B3P-LKD	4745	142	102	2.1%	Pass
E-01-P3-2B4P-Bedroom 1 DB	8760	263	161	1.8%	Pass
E-01-P3-2B4P-Bedroom 2 DB	8760	263	129	1.5%	Pass
E-01-P3-2B4P-LKD	4745	142	64	1.3%	Pass
E-01-P4-2B4P-Bedroom 1 DB	8760	263	279	3.2%	Fail
E-01-P4-2B4P-Bedroom 2 DB	8760	263	222	2.5%	Pass
E-01-P4-2B4P-LKD	4745	142	69	1.5%	Pass
E-02-P5-2B4P-Bedroom 1 DB	8760	263	169	1.9%	Pass
E-02-P5-2B4P-Bedroom 2 DB	8760	263	118	1.3%	Pass
E-02-P5-2B4P-LKD	4745	142	46	1.0%	Pass
E-02-P6-2B4P-Bedroom 1 DB	8760	263	289	3.3%	Fail
E-02-P6-2B4P-Bedroom 2 DB	8760	263	224	2.6%	Pass
E-02-P6-2B4P-LKD	4745	142	65	1.4%	Pass

4.2.2 Mechanical Ventilation DSY 3

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
A-00-P1-2B3P-Bedroom 1 DB	8760	263	453	5.2%	Fail
A-00-P1-2B3P-Bedsroom 2 DB	8760	263	294	3.4%	Fail
A-00-P1-2B3P-LKD	4745	142	165	3.5%	Fail
A-00-P2-1B2P-Bedroom	8760	263	416	4.7%	Fail
A-00-P2-1B2P-LKD	4745	142	183	3.9%	Fail
A-01-P3-2B4P-Bedroom 1 DB	8760	263	468	5.3%	Fail
A-01-P3-2B4P-Bedroom 2 DB	8760	263	412	4.7%	Fail
A-01-P3-2B4P-LKD	4745	142	146	3.1%	Fail
A-01-P4-2B4P-Bedroom 1 DB	8760	263	462	5.3%	Fail
A-01-P4-2B4P-Bedroom 2 DB	8760	263	383	4.4%	Fail
A-01-P4-2B4P-LKD	4745	142	122	2.6%	Pass
A-02-P5-2B4P-Bedroom 1 DB	8760	263	433	4.9%	Fail
A-02-P5-2B4P-Bedroom 2 DB	8760	263	335	3.8%	Fail
A-02-P5-2B4P-LKD	4745	142	135	2.8%	Pass
A-02-P6-2B4P-Bedroom 1 DB	8760	263	489	5.6%	Fail
A-02-P6-2B4P-Bedroom 2 DB	8760	263	408	4.7%	Fail
A-02-P6-2B4P-LKD	4745	142	151	3.2%	Fail

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
BC-00-P1-2B3P-Bedroom 1 DB	8760	263	344	3.9%	Fail
BC-00-P1-2B3P-Bedroom 2 SB	8760	263	79	0.9%	Pass
BC-00-P1-2B3P-LKD	4745	142	99	2.1%	Pass
BC-00-P2-1B2P-Bedroom DB	8760	263	163	1.9%	Pass
BC-00-P2-1B2P-LKD	4745	142	101	2.1%	Pass
BC-00-P3-1B2P-Bedroom DB	8760	263	212	2.4%	Pass
BC-00-P3-1B2P-LKD	4745	142	119	2.5%	Pass
BC-00-P4-1B2P-Bedroom	8760	263	243	2.8%	Pass
BC-00-P4-1B2P-LKD	4745	142	197	4.2%	Fail
BC-01-P5-2B4P-Bedroom 1 DB	8760	263	242	2.8%	Pass
BC-01-P5-2B4P-Bedroom 2 DB	8760	263	164	1.9%	Pass
BC-01-P5-2B4P-LKD	4745	142	41	0.9%	Pass
BC-01-P6-2B4P-Bedroom 1 D	8760	263	231	2.6%	Pass
BC-01-P6-2B4P-Bedroom 2 D	8760	263	237	2.7%	Pass
BC-01-P6-2B4P-KLD	4745	142	101	2.1%	Pass
BC-01-P07-2B4P-Bedroom 1 D	8760	263	207	2.4%	Pass
BC-01-P07-2B4P-Bedroom 2 D	8760	263	252	2.9%	Pass
BC-01-P07-2B4P-LKD	4745	142	104	2.2%	Pass
BC-01-P08 2B4P-Bedroom 1 D	8760	263	356	4.1%	Fail
BC-01-P08 2B4P-Bedroom 2 D	8760	263	296	3.4%	Fail
BC-01-P08 2B4P-LKD	4745	142	127	2.7%	Pass
BC-02-P5-2B4P-Bedroom 1 DB	8760	263	252	2.9%	Pass
BC-02-P5-2B4P-Bedroom 2 DB	8760	263	175	2.0%	Pass
BC-02-P5-2B4P-LKD	4745	142	44	0.9%	Pass
BC-02-P10-2B4P-Bedroom 1 D	8760	263	320	3.7%	Fail
BC-02-P10-2B4P-Bedroom 2 D	8760	263	262	3.0%	Pass
BC-02-P10-2B4P-LKD	4745	142	177	3.7%	Fail
BC-02-P11-2B4P-Bedroom 1 D	8760	263	239	2.7%	Pass
BC-02-P11-2B4P-Bedroom 2 D	8760	263	261	3.0%	Pass
BC-02-P11-2B4P-LKD	4745	142	173	3.6%	Fail
BC-02-P12 2B4P-Bedroom 1 D	8760	263	388	4.4%	Fail
BC-02-P12 2B4P-Bedroom 2 D	8760	263	321	3.7%	Fail
BC-02-P12 2B4P-LKD	4745	142	131	2.8%	Pass

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
E-00-P1-1B2P-Bedroom DB	8760	263	414	4.7%	Fail
E-00-P1-1B2P-LKD	4745	142	135	2.8%	Pass
E-00-P2-2B3P-Bedroom 1 DB	8760	263	361	4.1%	Fail
E-00-P2-2B3P-Bedroom 2 SB	8760	263	332	3.8%	Fail
E-00-P2-2B3P-LKD	4745	142	166	3.5%	Fail
E-01-P3-2B4P-Bedroom 1 DB	8760	263	201	2.3%	Pass
E-01-P3-2B4P-Bedroom 2 DB	8760	263	154	1.8%	Pass
E-01-P3-2B4P-LKD	4745	142	73	1.5%	Pass
E-01-P4-2B4P-Bedroom 1 DB	8760	263	397	4.5%	Fail
E-01-P4-2B4P-Bedroom 2 DB	8760	263	336	3.8%	Fail
E-01-P4-2B4P-LKD	4745	142	101	2.1%	Pass
E-02-P5-2B4P-Bedroom 1 DB	8760	263	212	2.4%	Pass
E-02-P5-2B4P-Bedroom 2 DB	8760	263	143	1.6%	Pass
E-02-P5-2B4P-LKD	4745	142	53	1.1%	Pass
E-02-P6-2B4P-Bedroom 1 DB	8760	263	409	4.7%	Fail
E-02-P6-2B4P-Bedroom 2 DB	8760	263	336	3.8%	Fail
E-02-P6-2B4P-LKD	4745	142	90	1.9%	Pass

A high level of compliance is achieved when assessed against DSY's 2 and 3, which represent heat wave conditions, based on weather data records of 2003 and 1976 respectively.

4.3 Future Compliance Files (2050's and 2080's)

The overcome the potential risk of increasing temperatures, external shutters would be a relatively straightforward remedial action that could be added to the building façade, without causing disruption to the residents.

The results below represent the use of a variable shutter (eg roller) with 10% light admittance. The shutter has been simulated to start to close when the solar intensity reaches 350W/m^2 and is fully closed at 400W/m^2.

4.3.1 Mechanical Ventilation 2050 DSY 1

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
A-00-P1-2B3P-Bedroom 1 DB	8760	263	79	0.9%	Pass
A-00-P1-2B3P-Bedsroom 2 DB	8760	263	28	0.3%	Pass
A-00-P1-2B3P-LKD	4745	142	6	0.1%	Pass
A-00-P2-1B2P-Bedroom	8760	263	96	1.1%	Pass
A-00-P2-1B2P-LKD	4745	142	18	0.4%	Pass
A-01-P3-2B4P-Bedroom 1 DB	8760	263	102	1.2%	Pass
A-01-P3-2B4P-Bedroom 2 DB	8760	263	79	0.9%	Pass
A-01-P3-2B4P-LKD	4745	142	17	0.4%	Pass
A-01-P4-2B4P-Bedroom 1 DB	8760	263	108	1.2%	Pass
A-01-P4-2B4P-Bedroom 2 DB	8760	263	59	0.7%	Pass
A-01-P4-2B4P-LKD	4745	142	1	0.0%	Pass
A-02-P5-2B4P-Bedroom 1 DB	8760	263	127	1.4%	Pass
A-02-P5-2B4P-Bedroom 2 DB	8760	263	78	0.9%	Pass
A-02-P5-2B4P-LKD	4745	142	14	0.3%	Pass
A-02-P6-2B4P-Bedroom 1 DB	8760	263	144	1.6%	Pass
A-02-P6-2B4P-Bedroom 2 DB	8760	263	86	1.0%	Pass
A-02-P6-2B4P-LKD	4745	142	4	0.1%	Pass

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
BC-00-P1-2B3P-Bedroom 1 DB	8760	263	58	0.7%	Pass
BC-00-P1-2B3P-Bedroom 2 SB	8760	263	1	0.0%	Pass
BC-00-P1-2B3P-LKD	8760	263	4	0.0%	Pass
BC-00-P2-1B2P-Bedroom DB	8760	263	39	0.4%	Pass
BC-00-P2-1B2P-LKD	8760	263	14	0.2%	Pass
BC-00-P3-1B2P-Bedroom DB	8760	263	56	0.6%	Pass
BC-00-P3-1B2P-LKD	8760	263	23	0.3%	Pass
BC-00-P4-1B2P-Bedroom	8760	263	42	0.5%	Pass
BC-00-P4-1B2P-LKD	8760	263	35	0.4%	Pass
BC-01-P5-2B4P-Bedroom 1 DB	8760	263	44	0.5%	Pass
BC-01-P5-2B4P-Bedroom 2 DB	8760	263	16	0.2%	Pass
BC-01-P5-2B4P-LKD	8760	263	0	0.0%	Pass
BC-01-P6-2B4P-Bedroom 1 D	8760	263	61	0.7%	Pass
BC-01-P6-2B4P-Bedroom 2 D	8760	263	63	0.7%	Pass
BC-01-P6-2B4P-KLD	8760	263	9	0.1%	Pass
BC-01-P07-2B4P-Bedroom 1 D	8760	263	57	0.7%	Pass
BC-01-P07-2B4P-Bedroom 2 D	8760	263	66	0.8%	Pass
BC-01-P07-2B4P-LKD	8760	263	9	0.1%	Pass
BC-01-P08 2B4P-Bedroom 1 D	8760	263	94	1.1%	Pass
BC-01-P08 2B4P-Bedroom 2 D	8760	263	65	0.7%	Pass
BC-01-P08 2B4P-LKD	8760	263	11	0.1%	Pass
BC-02-P5-2B4P-Bedroom 1 DB	8760	263	56	0.6%	Pass
BC-02-P5-2B4P-Bedroom 2 DB	8760	263	33	0.4%	Pass
BC-02-P5-2B4P-LKD	8760	263	0	0.0%	Pass
BC-02-P10-2B4P-Bedroom 1 D	8760	263	81	0.9%	Pass
BC-02-P10-2B4P-Bedroom 2 D	8760	263	69	0.8%	Pass
BC-02-P10-2B4P-LKD	8760	263	21	0.2%	Pass
BC-02-P11-2B4P-Bedroom 1 D	8760	263	68	0.8%	Pass
BC-02-P11-2B4P-Bedroom 2 D	8760	263	71	0.8%	Pass
BC-02-P11-2B4P-LKD	8760	263	24	0.3%	Pass
BC-02-P12 2B4P-Bedroom 1 D	8760	263	126	1.4%	Pass
BC-02-P12 2B4P-Bedroom 2 D	8760	263	78	0.9%	Pass
BC-02-P12 2B4P-LKD	8760	263	13	0.1%	Pass

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
E-00-P1-1B2P-Bedroom DB	8760	263	139	1.6%	Pass
E-00-P1-1B2P-LKD	4745	142	18	0.4%	Pass
E-00-P2-2B3P-Bedroom 1 DB	8760	263	76	0.9%	Pass
E-00-P2-2B3P-Bedroom 2 SB	8760	263	80	0.9%	Pass
E-00-P2-2B3P-LKD	4745	142	12	0.3%	Pass
E-01-P3-2B4P-Bedroom 1 DB	8760	263	42	0.5%	Pass
E-01-P3-2B4P-Bedroom 2 DB	8760	263	25	0.3%	Pass
E-01-P3-2B4P-LKD	4745	142	5	0.1%	Pass
E-01-P4-2B4P-Bedroom 1 DB	8760	263	95	1.1%	Pass
E-01-P4-2B4P-Bedroom 2 DB	8760	263	53	0.6%	Pass
E-01-P4-2B4P-LKD	4745	142	1	0.0%	Pass
E-02-P5-2B4P-Bedroom 1 DB	8760	263	58	0.7%	Pass
E-02-P5-2B4P-Bedroom 2 DB	8760	263	25	0.3%	Pass
E-02-P5-2B4P-LKD	4745	142	3	0.1%	Pass
E-02-P6-2B4P-Bedroom 1 DB	8760	263	116	1.3%	Pass
E-02-P6-2B4P-Bedroom 2 DB	8760	263	63	0.7%	Pass
E-02-P6-2B4P-LKD	4745	142	1	0.0%	Pass

4.3.2 Mechanical Ventilation 2080 DSY 1

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
A-00-P1-2B3P-Bedroom 1 DB	8760	263	299	3.4%	Fail
A-00-P1-2B3P-Bedsroom 2 DB	8760	263	208	2.4%	Pass
A-00-P1-2B3P-LKD	4745	142	77	1.6%	Pass
A-00-P2-1B2P-Bedroom	8760	263	392	4.5%	Fail
A-00-P2-1B2P-LKD	4745	142	99	2.1%	Pass
A-01-P3-2B4P-Bedroom 1 DB	8760	263	342	3.9%	Fail
A-01-P3-2B4P-Bedroom 2 DB	8760	263	296	3.4%	Fail
A-01-P3-2B4P-LKD	4745	142	94	2.0%	Pass
A-01-P4-2B4P-Bedroom 1 DB	8760	263	319	3.6%	Fail
A-01-P4-2B4P-Bedroom 2 DB	8760	263	226	2.6%	Pass
A-01-P4-2B4P-LKD	4745	142	62	1.3%	Pass
A-02-P5-2B4P-Bedroom 1 DB	8760	263	395	4.5%	Fail
A-02-P5-2B4P-Bedroom 2 DB	8760	263	293	3.3%	Fail
A-02-P5-2B4P-LKD	4745	142	87	1.8%	Pass
A-02-P6-2B4P-Bedroom 1 DB	8760	263	399	4.6%	Fail
A-02-P6-2B4P-Bedroom 2 DB	8760	263	285	3.3%	Fail
A-02-P6-2B4P-LKD	4745	142	73	1.5%	Pass

`	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
BC-00-P1-2B3P-Bedroom 1 DB	8760	263	225	2.6%	Pass
BC-00-P1-2B3P-Bedroom 2 SB	8760	263	75	0.9%	Pass
BC-00-P1-2B3P-LKD	4745	142	54	1.1%	Pass
BC-00-P2-1B2P-Bedroom DB	8760	263	149	1.7%	Pass
BC-00-P2-1B2P-LKD	4745	142	66	1.4%	Pass
BC-00-P3-1B2P-Bedroom DB	8760	263	179	2.0%	Pass
BC-00-P3-1B2P-LKD	4745	142	70	1.5%	Pass
BC-00-P4-1B2P-Bedroom	8760	263	146	1.7%	Pass
BC-00-P4-1B2P-LKD	4745	142	103	2.2%	Pass
BC-01-P5-2B4P-Bedroom 1 DB	8760	263	199	2.3%	Pass
BC-01-P5-2B4P-Bedroom 2 DB	8760	263	142	1.6%	Pass
BC-01-P5-2B4P-LKD	4745	142	38	0.8%	Pass
BC-01-P6-2B4P-Bedroom 1 D	8760	263	194	2.2%	Pass
BC-01-P6-2B4P-Bedroom 2 D	8760	263	209	2.4%	Pass
BC-01-P6-2B4P-KLD	4745	142	64	1.3%	Pass
BC-01-P07-2B4P-Bedroom 1 D	8760	263	192	2.2%	Pass
BC-01-P07-2B4P-Bedroom 2 D	8760	263	223	2.5%	Pass
BC-01-P07-2B4P-LKD	4745	142	65	1.4%	Pass
BC-01-P08 2B4P-Bedroom 1 D	8760	263	284	3.2%	Fail
BC-01-P08 2B4P-Bedroom 2 D	8760	263	214	2.4%	Pass
BC-01-P08 2B4P-LKD	4745	142	72	1.5%	Pass
BC-02-P5-2B4P-Bedroom 1 DB	8760	263	215	2.5%	Pass
BC-02-P5-2B4P-Bedroom 2 DB	8760	263	168	1.9%	Pass
BC-02-P5-2B4P-LKD	4745	142	47	1.0%	Pass
BC-02-P10-2B4P-Bedroom 1 D	8760	263	267	3.0%	Fail
BC-02-P10-2B4P-Bedroom 2 D	8760	263	227	2.6%	Pass
BC-02-P10-2B4P-LKD	4745	142	81	1.7%	Pass
BC-02-P11-2B4P-Bedroom 1 D	8760	263	241	2.8%	Pass
BC-02-P11-2B4P-Bedroom 2 D	8760	263	237	2.7%	Pass
BC-02-P11-2B4P-LKD	4745	142	81	1.7%	Pass
BC-02-P12 2B4P-Bedroom 1 D	8760	263	341	3.9%	Fail
BC-02-P12 2B4P-Bedroom 2 D	8760	263	259	3.0%	Pass
BC-02-P12 2B4P-LKD	4745	142	82	1.7%	Pass

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
E-00-P1-1B2P-Bedroom DB	8760	263	450	5.1%	Fail
E-00-P1-1B2P-LKD	4745	142	89	1.9%	Pass
E-00-P2-2B3P-Bedroom 1 DB	8760	263	323	3.7%	Fail
E-00-P2-2B3P-Bedroom 2 SB	8760	263	294	3.4%	Fail
E-00-P2-2B3P-LKD	4745	142	90	1.9%	Pass
E-01-P3-2B4P-Bedroom 1 DB	8760	263	217	2.5%	Pass
E-01-P3-2B4P-Bedroom 2 DB	8760	263	181	2.1%	Pass
E-01-P3-2B4P-LKD	4745	142	69	1.5%	Pass
E-01-P4-2B4P-Bedroom 1 DB	8760	263	283	3.2%	Fail
E-01-P4-2B4P-Bedroom 2 DB	8760	263	222	2.5%	Pass
E-01-P4-2B4P-LKD	4745	142	62	1.3%	Pass
E-02-P5-2B4P-Bedroom 1 DB	8760	263	231	2.6%	Pass
E-02-P5-2B4P-Bedroom 2 DB	8760	263	180	2.1%	Pass
E-02-P5-2B4P-LKD	4745	142	58	1.2%	Pass
E-02-P6-2B4P-Bedroom 1 DB	8760	263	312	3.6%	Fail
E-02-P6-2B4P-Bedroom 2 DB	8760	263	228	2.6%	Pass
E-02-P6-2B4P-LKD	4745	142	59	1.2%	Pass

4.4 Good Practice Future Compliance: (2050's and 2080's)

4.4.1 Mechanical Ventilation DSY 2 2050's

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
A-00-P1-2B3P-Bedroom 1 DB	8760	263	156	1.8%	Pass
A-00-P1-2B3P-Bedsroom 2 DB	8760	263	109	1.2%	Pass
A-00-P1-2B3P-LKD	4745	142	33	0.7%	Pass
A-00-P2-1B2P-Bedroom	8760	263	209	2.4%	Pass
A-00-P2-1B2P-LKD	4745	142	53	1.1%	Pass
A-01-P3-2B4P-Bedroom 1 DB	8760	263	193	2.2%	Pass
A-01-P3-2B4P-Bedroom 2 DB	8760	263	164	1.9%	Pass
A-01-P3-2B4P-LKD	4745	142	55	1.2%	Pass
A-01-P4-2B4P-Bedroom 1 DB	8760	263	180	2.1%	Pass
A-01-P4-2B4P-Bedroom 2 DB	8760	263	135	1.5%	Pass
A-01-P4-2B4P-LKD	4745	142	28	0.6%	Pass
A-02-P5-2B4P-Bedroom 1 DB	8760	263	224	2.6%	Pass
A-02-P5-2B4P-Bedroom 2 DB	8760	263	167	1.9%	Pass
A-02-P5-2B4P-LKD	4745	142	55	1.2%	Pass
A-02-P6-2B4P-Bedroom 1 DB	8760	263	219	2.5%	Pass
A-02-P6-2B4P-Bedroom 2 DB	8760	263	159	1.8%	Pass
A-02-P6-2B4P-LKD	4745	142	42	0.9%	Pass

`	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
BC-00-P1-2B3P-Bedroom 1 DB	8760	263	118	1.3%	Pass
BC-00-P1-2B3P-Bedroom 2 SB	8760	263	21	0.2%	Pass
BC-00-P1-2B3P-LKD	4745	142	17	0.4%	Pass
BC-00-P2-1B2P-Bedroom DB	8760	263	113	1.3%	Pass
BC-00-P2-1B2P-LKD	4745	142	47	1.0%	Pass
BC-00-P3-1B2P-Bedroom DB	8760	263	142	1.6%	Pass
BC-00-P3-1B2P-LKD	4745	142	53	1.1%	Pass
BC-00-P4-1B2P-Bedroom	8760	263	116	1.3%	Pass
BC-00-P4-1B2P-LKD	4745	142	81	1.7%	Pass
BC-01-P5-2B4P-Bedroom 1 DB	8760	263	122	1.4%	Pass
BC-01-P5-2B4P-Bedroom 2 DB	8760	263	64	0.7%	Pass
BC-01-P5-2B4P-LKD	4745	142	8	0.2%	Pass
BC-01-P6-2B4P-Bedroom 1 D	8760	263	168	1.9%	Pass
BC-01-P6-2B4P-Bedroom 2 D	8760	263	158	1.8%	Pass
BC-01-P6-2B4P-KLD	4745	142	39	0.8%	Pass
BC-01-P07-2B4P-Bedroom 1 D	8760	263	158	1.8%	Pass
BC-01-P07-2B4P-Bedroom 2 D	8760	263	181	2.1%	Pass
BC-01-P07-2B4P-LKD	4745	142	42	0.9%	Pass
BC-01-P08 2B4P-Bedroom 1 D	8760	263	232	2.6%	Pass
BC-01-P08 2B4P-Bedroom 2 D	8760	263	174	2.0%	Pass
BC-01-P08 2B4P-LKD	4745	142	47	1.0%	Pass
BC-02-P5-2B4P-Bedroom 1 DB	8760	263	167	1.9%	Pass
BC-02-P5-2B4P-Bedroom 2 DB	8760	263	93	1.1%	Pass
BC-02-P5-2B4P-LKD	4745	142	11	0.2%	Pass
BC-02-P10-2B4P-Bedroom 1 D	8760	263	208	2.4%	Pass
BC-02-P10-2B4P-Bedroom 2 D	8760	263	177	2.0%	Pass
BC-02-P10-2B4P-LKD	4745	142	53	1.1%	Pass
BC-02-P11-2B4P-Bedroom 1 D	8760	263	184	2.1%	Pass
BC-02-P11-2B4P-Bedroom 2 D	8760	263	190	2.2%	Pass
BC-02-P11-2B4P-LKD	4745	142	57	1.2%	Pass
BC-02-P12 2B4P-Bedroom 1 D	8760	263	286	3.3%	Fail
BC-02-P12 2B4P-Bedroom 2 D	8760	263	214	2.4%	Pass
BC-02-P12 2B4P-LKD	4745	142	60	1.3%	Pass

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
E-00-P1-1B2P-Bedroom DB	8760	263	261	3.0%	Pass
E-00-P1-1B2P-LKD	4745	142	55	1.2%	Pass
E-00-P2-2B3P-Bedroom 1 DB	8760	263	171	2.0%	Pass
E-00-P2-2B3P-Bedroom 2 SB	8760	263	144	1.6%	Pass
E-00-P2-2B3P-LKD	4745	142	38	0.8%	Pass
E-01-P3-2B4P-Bedroom 1 DB	8760	263	140	1.6%	Pass
E-01-P3-2B4P-Bedroom 2 DB	8760	263	116	1.3%	Pass
E-01-P3-2B4P-LKD	4745	142	41	0.9%	Pass
E-01-P4-2B4P-Bedroom 1 DB	8760	263	173	2.0%	Pass
E-01-P4-2B4P-Bedroom 2 DB	8760	263	136	1.6%	Pass
E-01-P4-2B4P-LKD	4745	142	28	0.6%	Pass
E-02-P5-2B4P-Bedroom 1 DB	8760	263	152	1.7%	Pass
E-02-P5-2B4P-Bedroom 2 DB	8760	263	118	1.3%	Pass
E-02-P5-2B4P-LKD	4745	142	30	0.6%	Pass
E-02-P6-2B4P-Bedroom 1 DB	8760	263	195	2.2%	Pass
E-02-P6-2B4P-Bedroom 2 DB	8760	263	146	1.7%	Pass
E-02-P6-2B4P-LKD	4745	142	29	0.6%	Pass

4.4.2 Mechanical Ventilation DSY 3 2050's

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
A-00-P1-2B3P-Bedroom 1 DB	8760	263	164	1.9%	Pass
A-00-P1-2B3P-Bedsroom 2 DB	8760	263	70	0.8%	Pass
A-00-P1-2B3P-LKD	4745	142	18	0.4%	Pass
A-00-P2-1B2P-Bedroom	8760	263	198	2.3%	Pass
A-00-P2-1B2P-LKD	4745	142	46	1.0%	Pass
A-01-P3-2B4P-Bedroom 1 DB	8760	263	220	2.5%	Pass
A-01-P3-2B4P-Bedroom 2 DB	8760	263	171	2.0%	Pass
A-01-P3-2B4P-LKD	4745	142	41	0.9%	Pass
A-01-P4-2B4P-Bedroom 1 DB	8760	263	206	2.4%	Pass
A-01-P4-2B4P-Bedroom 2 DB	8760	263	124	1.4%	Pass
A-01-P4-2B4P-LKD	4745	142	13	0.3%	Pass
A-02-P5-2B4P-Bedroom 1 DB	8760	263	280	3.2%	Fail
A-02-P5-2B4P-Bedroom 2 DB	8760	263	189	2.2%	Pass
A-02-P5-2B4P-LKD	4745	142	40	0.8%	Pass
A-02-P6-2B4P-Bedroom 1 DB	8760	263	300	3.4%	Fail
A-02-P6-2B4P-Bedroom 2 DB	8760	263	190	2.2%	Pass
A-02-P6-2B4P-LKD	4745	142	28	0.6%	Pass

`	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
BC-00-P1-2B3P-Bedroom 1 DB	8760	263	118	1.3%	Pass
BC-00-P1-2B3P-Bedroom 2 SB	8760	263	21	0.2%	Pass
BC-00-P1-2B3P-LKD	4745	142	17	0.4%	Pass
BC-00-P2-1B2P-Bedroom DB	8760	263	113	1.3%	Pass
BC-00-P2-1B2P-LKD	4745	142	47	1.0%	Pass
BC-00-P3-1B2P-Bedroom DB	8760	263	142	1.6%	Pass
BC-00-P3-1B2P-LKD	4745	142	53	1.1%	Pass
BC-00-P4-1B2P-Bedroom	8760	263	116	1.3%	Pass
BC-00-P4-1B2P-LKD	4745	142	81	1.7%	Pass
BC-01-P5-2B4P-Bedroom 1 DB	8760	263	122	1.4%	Pass
BC-01-P5-2B4P-Bedroom 2 DB	8760	263	64	0.7%	Pass
BC-01-P5-2B4P-LKD	4745	142	8	0.2%	Pass
BC-01-P6-2B4P-Bedroom 1 D	8760	263	168	1.9%	Pass
BC-01-P6-2B4P-Bedroom 2 D	8760	263	158	1.8%	Pass
BC-01-P6-2B4P-KLD	4745	142	39	0.8%	Pass
BC-01-P07-2B4P-Bedroom 1 D	8760	263	158	1.8%	Pass
BC-01-P07-2B4P-Bedroom 2 D	8760	263	181	2.1%	Pass
BC-01-P07-2B4P-LKD	4745	142	42	0.9%	Pass
BC-01-P08 2B4P-Bedroom 1 D	8760	263	232	2.6%	Pass
BC-01-P08 2B4P-Bedroom 2 D	8760	263	174	2.0%	Pass
BC-01-P08 2B4P-LKD	4745	142	47	1.0%	Pass
BC-02-P5-2B4P-Bedroom 1 DB	8760	263	167	1.9%	Pass
BC-02-P5-2B4P-Bedroom 2 DB	8760	263	93	1.1%	Pass
BC-02-P5-2B4P-LKD	4745	142	11	0.2%	Pass
BC-02-P10-2B4P-Bedroom 1 D	8760	263	208	2.4%	Pass
BC-02-P10-2B4P-Bedroom 2 D	8760	263	177	2.0%	Pass
BC-02-P10-2B4P-LKD	4745	142	53	1.1%	Pass
BC-02-P11-2B4P-Bedroom 1 D	8760	263	184	2.1%	Pass
BC-02-P11-2B4P-Bedroom 2 D	8760	263	190	2.2%	Pass
BC-02-P11-2B4P-LKD	4745	142	57	1.2%	Pass
BC-02-P12 2B4P-Bedroom 1 D	8760	263	286	3.3%	Fail
BC-02-P12 2B4P-Bedroom 2 D	8760	263	214	2.4%	Pass
BC-02-P12 2B4P-LKD	4745	142	60	1.3%	Pass

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
E-00-P1-1B2P-Bedroom DB	8760	263	721	8.2%	Fail
E-00-P1-1B2P-LKD	4745	142	173	3.6%	Fail
E-00-P2-2B3P-Bedroom 1 DB	8760	263	691	7.9%	Fail
E-00-P2-2B3P-Bedroom 2 SB	8760	263	560	6.4%	Fail
E-00-P2-2B3P-LKD	4745	142	176	3.7%	Fail
E-01-P3-2B4P-Bedroom 1 DB	8760	263	358	4.1%	Fail
E-01-P3-2B4P-Bedroom 2 DB	8760	263	301	3.4%	Fail
E-01-P3-2B4P-LKD	4745	142	122	2.6%	Pass
E-01-P4-2B4P-Bedroom 1 DB	8760	263	595	6.8%	Fail
E-01-P4-2B4P-Bedroom 2 DB	8760	263	422	4.8%	Fail
E-01-P4-2B4P-LKD	4745	142	96	2.0%	Pass
E-02-P5-2B4P-Bedroom 1 DB	8760	263	425	4.9%	Fail
E-02-P5-2B4P-Bedroom 2 DB	8760	263	301	3.4%	Fail
E-02-P5-2B4P-LKD	4745	142	98	2.1%	Pass
E-02-P6-2B4P-Bedroom 1 DB	8760	263	630	7.2%	Fail
E-02-P6-2B4P-Bedroom 2 DB	8760	263	432	4.9%	Fail
E-02-P6-2B4P-LKD	4745	142	95	2.0%	Pass

4.4.3 Mechanical Ventilation DSY 2 2080's

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
A-00-P1-2B3P-Bedroom 1 DB	8760	263	660	7.5%	Fail
A-00-P1-2B3P-Bedsroom 2 DB	8760	263	382	4.4%	Fail
A-00-P1-2B3P-LKD	4745	142	152	3.2%	Fail
A-00-P2-1B2P-Bedroom	8760	263	719	8.2%	Fail
A-00-P2-1B2P-LKD	4745	142	189	4.0%	Fail
A-01-P3-2B4P-Bedroom 1 DB	8760	263	640	7.3%	Fail
A-01-P3-2B4P-Bedroom 2 DB	8760	263	534	6.1%	Fail
A-01-P3-2B4P-LKD	4745	142	156	3.3%	Fail
A-01-P4-2B4P-Bedroom 1 DB	8760	263	639	7.3%	Fail
A-01-P4-2B4P-Bedroom 2 DB	8760	263	451	5.1%	Fail
A-01-P4-2B4P-LKD	4745	142	93	2.0%	Pass
A-02-P5-2B4P-Bedroom 1 DB	8760	263	743	8.5%	Fail
A-02-P5-2B4P-Bedroom 2 DB	8760	263	550	6.3%	Fail
A-02-P5-2B4P-LKD	4745	142	146	3.1%	Fail
A-02-P6-2B4P-Bedroom 1 DB	8760	263	779	8.9%	Fail
A-02-P6-2B4P-Bedroom 2 DB	8760	263	534	6.1%	Fail
A-02-P6-2B4P-LKD	4745	142	111	2.3%	Pass

`	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
BC-00-P1-2B3P-Bedroom 1 DB	8760	263	527	6.0%	Fail
BC-00-P1-2B3P-Bedroom 2 SB	8760	263	162	1.8%	Pass
BC-00-P1-2B3P-LKD	4745	142	114	2.4%	Pass
BC-00-P2-1B2P-Bedroom DB	8760	263	374	4.3%	Fail
BC-00-P2-1B2P-LKD	4745	142	146	3.1%	Fail
BC-00-P3-1B2P-Bedroom DB	8760	263	414	4.7%	Fail
BC-00-P3-1B2P-LKD	4745	142	160	3.4%	Fail
BC-00-P4-1B2P-Bedroom	8760	263	336	3.8%	Fail
BC-00-P4-1B2P-LKD	4745	142	214	4.5%	Fail
BC-01-P5-2B4P-Bedroom 1 DB	8760	263	460	5.3%	Fail
BC-01-P5-2B4P-Bedroom 2 DB	8760	263	324	3.7%	Fail
BC-01-P5-2B4P-LKD	4745	142	66	1.4%	Pass
BC-01-P6-2B4P-Bedroom 1 D	8760	263	448	5.1%	Fail
BC-01-P6-2B4P-Bedroom 2 D	8760	263	461	5.3%	Fail
BC-01-P6-2B4P-KLD	4745	142	143	3.0%	Fail
BC-01-P07-2B4P-Bedroom 1 D	8760	263	433	4.9%	Fail
BC-01-P07-2B4P-Bedroom 2 D	8760	263	485	5.5%	Fail
BC-01-P07-2B4P-LKD	4745	142	149	3.1%	Fail
BC-01-P08 2B4P-Bedroom 1 D	8760	263	564	6.4%	Fail
BC-01-P08 2B4P-Bedroom 2 D	8760	263	463	5.3%	Fail
BC-01-P08 2B4P-LKD	4745	142	159	3.4%	Fail
BC-02-P5-2B4P-Bedroom 1 DB	8760	263	512	5.8%	Fail
BC-02-P5-2B4P-Bedroom 2 DB	8760	263	382	4.4%	Fail
BC-02-P5-2B4P-LKD	4745	142	98	2.1%	Pass
BC-02-P10-2B4P-Bedroom 1 D	8760	263	522	6.0%	Fail
BC-02-P10-2B4P-Bedroom 2 D	8760	263	483	5.5%	Fail
BC-02-P10-2B4P-LKD	4745	142	160	3.4%	Fail
BC-02-P11-2B4P-Bedroom 1 D	8760	263	474	5.4%	Fail
BC-02-P11-2B4P-Bedroom 2 D	8760	263	493	5.6%	Fail
BC-02-P11-2B4P-LKD	4745	142	163	3.4%	Fail
BC-02-P12 2B4P-Bedroom 1 D	8760	263	630	7.2%	Fail
BC-02-P12 2B4P-Bedroom 2 D	8760	263	522	6.0%	Fail
BC-02-P12 2B4P-LKD	4745	142	180	3.8%	Fail

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
E-00-P1-1B2P-Bedroom DB	8760	263	721	8.2%	Fail
E-00-P1-1B2P-LKD	4745	142	173	3.6%	Fail
E-00-P2-2B3P-Bedroom 1 DB	8760	263	691	7.9%	Fail
E-00-P2-2B3P-Bedroom 2 SB	8760	263	560	6.4%	Fail
E-00-P2-2B3P-LKD	4745	142	176	3.7%	Fail
E-01-P3-2B4P-Bedroom 1 DB	8760	263	358	4.1%	Fail
E-01-P3-2B4P-Bedroom 2 DB	8760	263	301	3.4%	Fail
E-01-P3-2B4P-LKD	4745	142	122	2.6%	Pass
E-01-P4-2B4P-Bedroom 1 DB	8760	263	595	6.8%	Fail
E-01-P4-2B4P-Bedroom 2 DB	8760	263	422	4.8%	Fail
E-01-P4-2B4P-LKD	4745	142	96	2.0%	Pass
E-02-P5-2B4P-Bedroom 1 DB	8760	263	425	4.9%	Fail
E-02-P5-2B4P-Bedroom 2 DB	8760	263	301	3.4%	Fail
E-02-P5-2B4P-LKD	4745	142	98	2.1%	Pass
E-02-P6-2B4P-Bedroom 1 DB	8760	263	630	7.2%	Fail
E-02-P6-2B4P-Bedroom 2 DB	8760	263	432	4.9%	Fail
E-02-P6-2B4P-LKD	4745	142	95	2.0%	Pass

4.4.4 Mechanical Ventilation DSY 3 2080's

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
A-00-P1-2B3P-Bedroom 1 DB	8760	263	647	7.4%	Fail
A-00-P1-2B3P-Bedsroom 2 DB	8760	263	420	4.8%	Fail
A-00-P1-2B3P-LKD	4745	142	170	3.6%	Fail
A-00-P2-1B2P-Bedroom	8760	263	701	8.0%	Fail
A-00-P2-1B2P-LKD	4745	142	213	4.5%	Fail
A-01-P3-2B4P-Bedroom 1 DB	8760	263	671	7.7%	Fail
A-01-P3-2B4P-Bedroom 2 DB	8760	263	579	6.6%	Fail
A-01-P3-2B4P-LKD	4745	142	184	3.9%	Fail
A-01-P4-2B4P-Bedroom 1 DB	8760	263	663	7.6%	Fail
A-01-P4-2B4P-Bedroom 2 DB	8760	263	503	5.7%	Fail
A-01-P4-2B4P-LKD	4745	142	118	2.5%	Pass
A-02-P5-2B4P-Bedroom 1 DB	8760	263	719	8.2%	Fail
A-02-P5-2B4P-Bedroom 2 DB	8760	263	589	6.7%	Fail
A-02-P5-2B4P-LKD	4745	142	182	3.8%	Fail
A-02-P6-2B4P-Bedroom 1 DB	8760	263	727	8.3%	Fail
A-02-P6-2B4P-Bedroom 2 DB	8760	263	579	6.6%	Fail
A-02-P6-2B4P-LKD	4745	142	154	3.2%	Fail

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
BC-00-P1-2B3P-Bedroom 1 DB	8760	263	1239	14.1%	Fail
BC-00-P1-2B3P-Bedroom 2 SB	8760	263	684	7.8%	Fail
BC-00-P1-2B3P-LKD	4745	142	516	10.9%	Fail
BC-00-P2-1B2P-Bedroom DB	8760	263	742	8.5%	Fail
BC-00-P2-1B2P-LKD	4745	142	381	8.0%	Fail
BC-00-P3-1B2P-Bedroom DB	8760	263	903	10.3%	Fail
BC-00-P3-1B2P-LKD	4745	142	439	9.3%	Fail
BC-00-P4-1B2P-Bedroom	8760	263	843	9.6%	Fail
BC-00-P4-1B2P-LKD	4745	142	555	11.7%	Fail
BC-01-P5-2B4P-Bedroom 1 DB	8760	263	982	11.2%	Fail
BC-01-P5-2B4P-Bedroom 2 DB	8760	263	845	9.6%	Fail
BC-01-P5-2B4P-LKD	4745	142	342	7.2%	Fail
BC-01-P6-2B4P-Bedroom 1 D	8760	263	880	10.0%	Fail
BC-01-P6-2B4P-Bedroom 2 D	8760	263	975	11.1%	Fail
BC-01-P6-2B4P-KLD	4745	142	375	7.9%	Fail
BC-01-P07-2B4P-Bedroom 1 D	8760	263	826	9.4%	Fail
BC-01-P07-2B4P-Bedroom 2 D	8760	263	976	11.1%	Fail
BC-01-P07-2B4P-LKD	4745	142	377	7.9%	Fail
BC-01-P08 2B4P-Bedroom 1 D	8760	263	1170	13.4%	Fail
BC-01-P08 2B4P-Bedroom 2 D	8760	263	1013	11.6%	Fail
BC-01-P08 2B4P-LKD	4745	142	391	8.2%	Fail
BC-02-P5-2B4P-Bedroom 1 DB	8760	263	969	11.1%	Fail
BC-02-P5-2B4P-Bedroom 2 DB	8760	263	814	9.3%	Fail
BC-02-P5-2B4P-LKD	4745	142	328	6.9%	Fail
BC-02-P10-2B4P-Bedroom 1 D	8760	263	1075	12.3%	Fail
BC-02-P10-2B4P-Bedroom 2 D	8760	263	1017	11.6%	Fail
BC-02-P10-2B4P-LKD	4745	142	580	12.2%	Fail
BC-02-P11-2B4P-Bedroom 1 D	8760	263	935	10.7%	Fail
BC-02-P11-2B4P-Bedroom 2 D	8760	263	995	11.4%	Fail
BC-02-P11-2B4P-LKD	4745	142	579	12.2%	Fail
BC-02-P12 2B4P-Bedroom 1 D	8760	263	1253	14.3%	Fail
BC-02-P12 2B4P-Bedroom 2 D	8760	263	1099	12.5%	Fail
BC-02-P12 2B4P-LKD	4745	142	394	8.3%	Fail

Room Ref	Annual Occupied Hours	Max ExceedabLe Hours	Hours >26°C	Max 3%	Result
E-00-P1-1B2P-Bedroom DB	8760	263	751	8.6%	Fail
E-00-P1-1B2P-LKD	4745	142	188	4.0%	Fail
E-00-P2-2B3P-Bedroom 1 DB	8760	263	664	7.6%	Fail
E-00-P2-2B3P-Bedroom 2 SB	8760	263	550	6.3%	Fail
E-00-P2-2B3P-LKD	4745	142	192	4.0%	Fail
E-01-P3-2B4P-Bedroom 1 DB	8760	263	477	5.4%	Fail
E-01-P3-2B4P-Bedroom 2 DB	8760	263	398	4.5%	Fail
E-01-P3-2B4P-LKD	4745	142	156	3.3%	Fail
E-01-P4-2B4P-Bedroom 1 DB	8760	263	620	7.1%	Fail
E-01-P4-2B4P-Bedroom 2 DB	8760	263	491	5.6%	Fail
E-01-P4-2B4P-LKD	4745	142	124	2.6%	Pass
E-02-P5-2B4P-Bedroom 1 DB	8760	263	522	6.0%	Fail
E-02-P5-2B4P-Bedroom 2 DB	8760	263	413	4.7%	Fail
E-02-P5-2B4P-LKD	4745	142	128	2.7%	Pass
E-02-P6-2B4P-Bedroom 1 DB	8760	263	640	7.3%	Fail
E-02-P6-2B4P-Bedroom 2 DB	8760	263	511	5.8%	Fail
E-02-P6-2B4P-LKD	4745	142	124	2.6%	Pass

5 CONCLUSION

Dynamic thermal modelling has been undertaken in accordance with the recommendations of Approved document Part O, and CIBSE Technical Memoranda 59, Design Methodology for the Assessment of Overheating Risk in Homes.

The assessment demonstrates that all apartments above ground floor level comply with the approved documents as both naturally ventilated and mechanically ventilated with the windows in the closed position.

The ground floor apartments are subject to additional security requirements preventing the windows from being opened over night. This leads to the apartments overheating during the night.

The site is subject to high levels traffic noise and the Noise Impact assessment recommends that he all windows on the facades facing Lansdowne Road should remain in the closed position. Due to this constraint it is proposed that mechanical ventilation with peak lop cooling will be applied to all dwellings, this also has the effect or providing compliant conditions within the ground floor apartments where windows operation is additional restricted for security purposes.

The majority of apartments comply with the criteria when the more extreme weather data sets for DSY2 and DSY3 are applied.

The proposed future mitigation measure to limit the overheating risk is the application of external shutters. These have the potential to achieve complaint conditions within most apartment types when assessed using DSY1 2050 and 2080 weather data sets.

The results contained within this assessment demonstrates that the façade and apartment layouts provide a good basis to mitigate overheating risk.

A1 APPENDIX 1 – TM59 INTERNAL HEAT GAINS

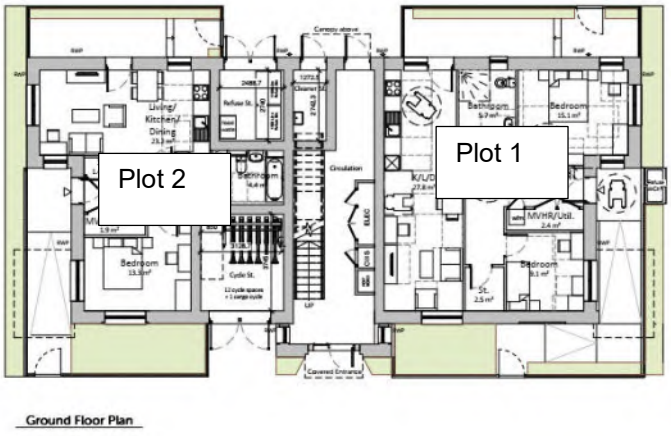
Unit/Room type	Occupancy	Equipment load
Studio	2 people at all times	Peak load of 450 W from 6 pm to 8 pm. 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and 10 pm to 12 pm Base load of 85 W for the rest of the day
1-bedroom apartment: living room/kitchen	1 person from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
2-bedroom apartment: living room/kitchen	2 people from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
3-bedroom apartment: living room/kitchen	3 people from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
3-bedroom apartment: living room	2 People at 75% gains 9am to 10pm; room is unoccupied for the rest of the day	Peak load of 150W from 6pm to 10pm 60W from 9am to 6pm and from 10pm to 12pm Base load of 35W for the rest of the day.
3-bedroom apartment: kitchen	3 people at 25% gains from 9am to 10pm; room is unoccupied for the rest of the day	Peak load of 300W from 6pm to 8pm Base load of 50W for the rest of the day.
Double Bedroom	2 people at 70% gains from 11 pm to 8 am 2 people at full gains from 8 am to 9 am and from 10 pm to 11 pm 1 person at full gain in the bedroom from 9 am to 10 pm	Peak load of 80 W from 8 am to 11 pm Base load of 10 W during the sleeping hours
Single Bedroom	1 person at 70% gains from 11 pm to 8 am 1 person at full gains from 8 am to 11 pm	Peak load of 80 W from 8 am to 11 pm Base load of 10 W during sleeping hours

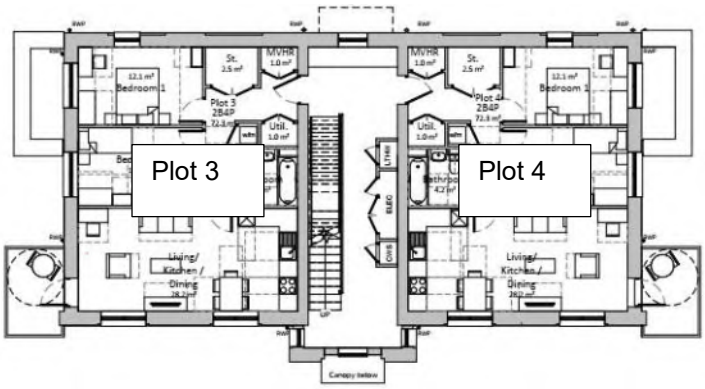
Notes:

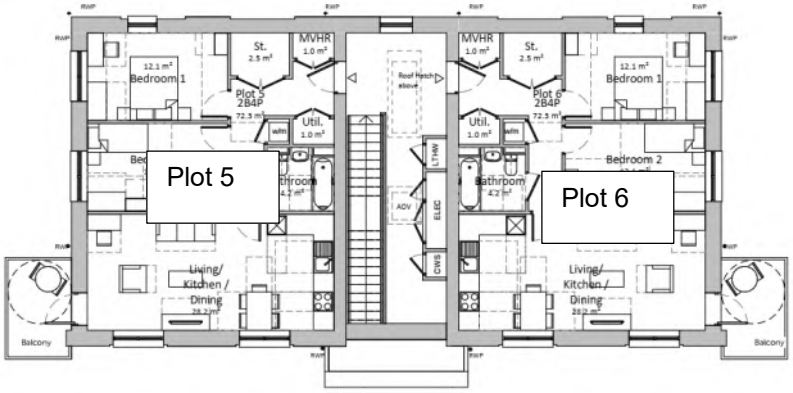
All time in GMT

A2 APPENDIX 2 – SAMPLE APARTMENT LOCATIONS

Block A Sample Apartments

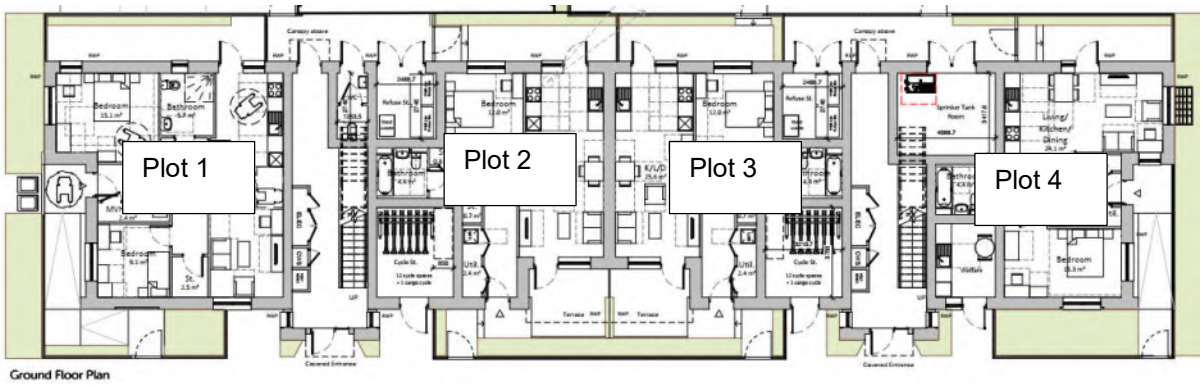




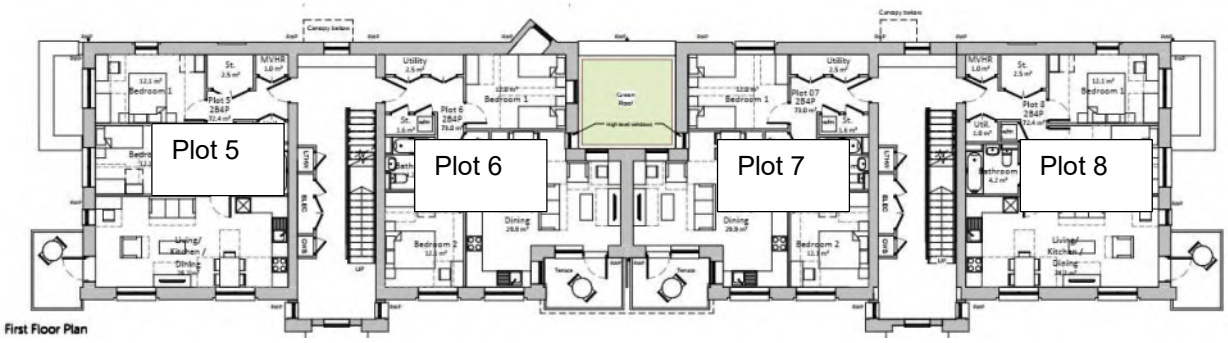


Second Floor Plan

Block B/C Sample Apartments



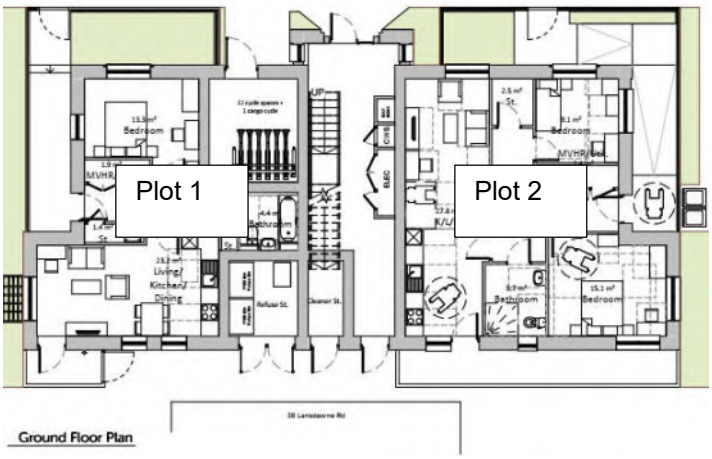
Ground Floor Plan



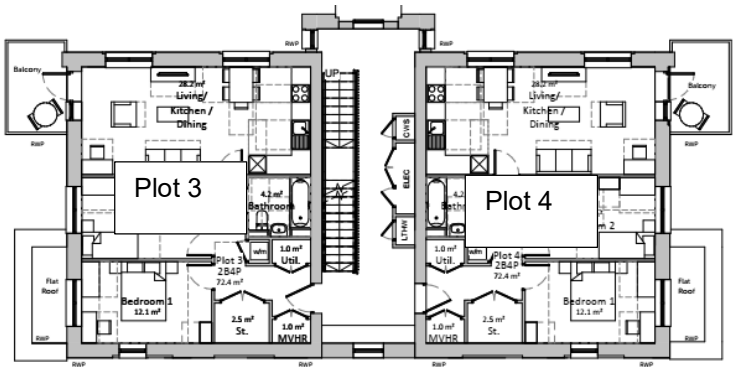
First Floor Plan

Second Floor Plan

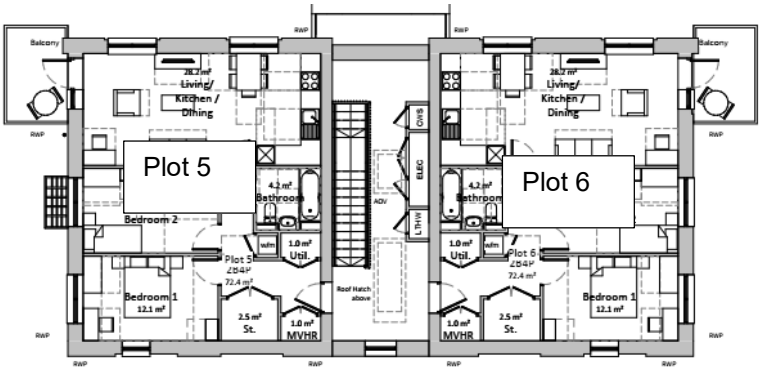
Block E Apartments



Ground Floor Plan



First Floor Plan



Second Floor Plan

A3 APPENDIX 3 – EXAMPLE OF MVHR COOLING MODULE

Technical Specification

Weight (ComfoClime / Combined with ComfoAir Q450)	62 / 112 Kg
Ducting ø	Internal - 215 mm
Condensate connection ø	32 mm
Filter grade	Standard - ISO Coarse / ISO Coarse (G4 / G4) Optional - ISO Coarse / ISO ePM1 (G4 / F7)
Materials	Internal EPP / ABS External coated sheet steel

ComfoClime

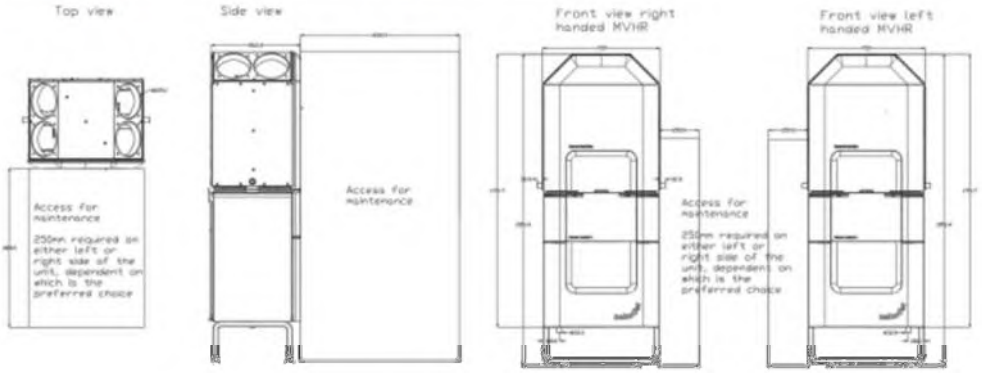
Supply voltage	230 V / single-phase / 50Hz
Maximum power consumption	1100 W
Current draw	4.87 A
Fuse rating	6 amp
Refrigerant	R32
Refrigerant volume	0.65 kg
EER	up to 3.47
Cooling capacity	Up to 1.7 kW
Heating capacity	Up to 2.2 kW
Global Warming Potential (AR4)	675

ComfoAir Q450

Supply voltage	230 V / single-phase / 50Hz
Maximum power consumption including / excluding pre-heater	2240 W / 250 W
Current draw including / excluding pre-heater	10.8 A / 1.98 A
Fuse rating including / excluding pre-heater	13 / 3 amp
Specific Fan Power	0.48 W/l/s
Heat Recovery Efficiency	0.96
Preheater power	2.0 kW

Dimensions

Height with / without turnable bends	2027 / 1951.4 mm
Width with / without turnable bends	859 / 720.7 mm
Depth	570 mm



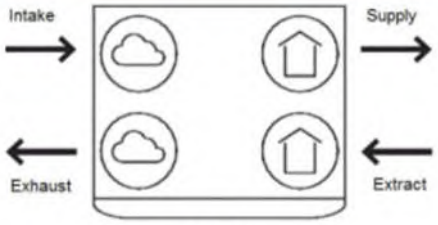
Performance Data

Air temperation									
External conditions		Internal conditions						Total	
Dry bulb temp °C	Wet bumb temp °C	Dry bulb temp °C	Wet bumb temp °C	Air flow l/s / m³hr	Power IN W	COP/EER	Cooling capacity W	COP/EER	Cooling capacity W
35	24	27	19	87 / 315	416	2.68	1116	4.49	2147
				116 / 420	592	2.94	1744	4.34	3076
31	22	27	19	87 / 315	375	3.02	1133	4.14	1807
				116 / 420	553	3.21	1774	3.86	2575
27	19	27	19	87 / 315	347	3.31	1149	2.59	1057
				116 / 420	492	3.47	1706	2.63	1592

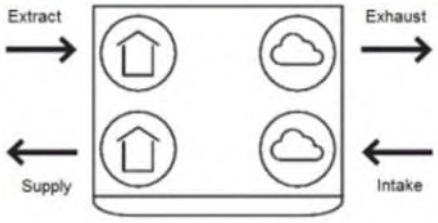
Supplementary heating									
External conditions		Internal conditions						Total	
Dry bulb temp °C	Wet bumb temp °C	Dry bulb temp °C	Wet bumb temp °C	Air flow l/s / m³hr	Power IN W	COP/EER	Heating capacity W	COP/EER	Heating capacity W
-7	-8	20	12	87 / 315	830	1.89	1567	5.41	4817
				116 / 420	749	2.21	1654	5.97	5502
2	1	20	12	87 / 315	665	2.42	1609	5.27	3831
				116 / 420	651	2.67	1738	5.76	4363
7	6	20	12	87 / 315	709	2.64	1872	4.50	3467
				116 / 420	801	2.77	2221	4.66	4214

Capacities tested according to EN 14511 and EN 16573 within a climatic chamber

Air Direction/Connection



Right Hand (factory setting)



Left Hand

A4 APPENDIX 4 – DRAWING REFERENCES

The following drawing references have informed the production of this report

Drawing Reference	Title	Rev	Company
LAAB -BPTW-01-ZZ-DR-A-1001	Block A - GA Plans.	P10	BPTW- Architects
LAAB-BPTW-02-ZZ-DR-A-1002	Block B & C - GA Plans.	P10	BPTW- Architects
LAAB -BPTW-04-ZZ-DR-A-1004	Block E - Plan GAs.pdf	P07	BPTW- Architects
LAAB -BPTW-01-ZZ-DR-A-2001	Block A - Elevations	P06	BPTW- Architects
LAAB-BPTW-02-ZZ-DR-A-2002	Block B & C - GA Elevations	P06	BPTW- Architects
LAAB -BPTW-04-ZZ-DR-A-2004	Block E - Elevations	P01	BPTW- Architects

A4 APPENDIX 4 – LEAN SAP DATA

SAP 10.2 Summary (Baseline)					
Sample Dwelling Ref	Sample Quantity	Area (m2)	TER (kgCO2/m2	TPER (kWpe/m2)	TFEE (kWh/m2)
1-M-N Gas	4	72.00	14.09	74.32	41.79
1-M-S Gas	4	72.00	14.39	75.94	43.18
1-T-N Gas	4	72.00	17.41	92.19	56.98
1-T-S Gas	4	72.00	17.70	93.75	58.33
2-G-N Gas	2	78.00	15.73	83.13	51.01
2-G-S Gas	1	78.00	15.29	80.75	48.96
3-G-N Gas	2	54.30	19.55	103.84	60.66
3-G-S Gas	3	54.30	19.35	102.78	59.75
4-M-N Gas	2	73.00	14.18	74.80	42.64
4-T-N Gas	2	73.00	16.51	87.31	53.21
5-G-N Gas	2	59.00	17.54	93.04	53.00
Area Weighted Value		2068	16.5	87.3	51.7

SAP 10.2 Summary (LEAN)					
Sample Dwelling Ref	Sample Quantity	Area (m2)	DER (kgCO2/m2	DPER (kWpe/m2)	DFEE (kWh/m2)
1-M-N Gas	4	72.00	11.85	68.87	35.00
1-M-S Gas	4	72.00	11.98	69.55	35.94
1-T-N Gas	4	72.00	15.53	88.63	51.41
1-T-S Gas	4	72.00	15.71	89.62	52.33
2-G-N Gas	2	78.00	13.36	76.83	43.78
2-G-S Gas	1	78.00	13.10	75.43	42.38
3-G-N Gas	2	54.30	17.10	97.37	52.60
3-G-S Gas	3	54.30	16.98	96.73	51.98
4-M-N Gas	2	73.00	12.14	70.34	36.75
4-T-N Gas	2	73.00	14.77	84.49	48.34
5-G-N Gas	2	59.00	15.57	89.13	47.38
Area Weighted Value		2068	14.3	82.3	45.2

Summary for Input Data

elmhurst energy

Property Reference	1-M-N Gas	**Issued on Date**	05/02/2024
Assessment Reference	1-M-N	**Prop Type Ref**	1-M-N Gas
Property			

SAP Rating	85 B	**DER**	11.85	**TER**	14.09
Environmental	90 B	**% DER < TER**			15.90
CO_2 Emissions (t/year)	0.81	**DFEE**	35.00	**TFEE**	41.79
Compliance Check	See BREL	**% DFEE < TFEE**			16.26
% DPER < TPER	7.34	**DPER**	68.87	**TPER**	74.32

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Mid-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	25.00 m	72.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	28.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	24.00	22.50	0.00	None	1.50	Enter Gross Area
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	24.00	20.70	0.00	None	3.30	Enter Gross Area
West	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	28.00	21.67	0.00	None	6.33	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	28.00	25.80	2.50	Stairwell Stairwell 2	2.20	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	93.00

10.1 Party Ceilings

Summary for Input Data

elmhurst energy

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling	Concrete floor slab, carpeted	100.00	72.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Exposed Floor - Solid	Lowest occupied	Other	0.11	Garage Single 1 Inside	0.70	0.00	20.00

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Concrete floor slab, carpeted	100.00	47.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
North	Window	North	North	1.50	0
Opening	Window	West	West	6.33	0
Opening	Window	South	South	3.30	0
Opening	Door	Wall to Common	North	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	8.50	0.05	0.05	No
E3 Sill	Independently assessed	7.30	0.05	0.05	No
E4 Jamb	Independently assessed	16.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	6.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	100.00	0.07	0.07	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	6.00	0.02	0.02	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Independently assessed	8.00	0.00	0.00	No

Y-value	0.09	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

Summary for Input Data

elmhurst energy

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	Manufacturer	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	102	
In Winter	88.80	
In Summer	79.80	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2106	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From header tank
Bath Count	1
Supplementary Immersion	No

Summary for Input Data

elmhurst energy

Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	1-M-N Gas	**Issued on Date**	05/02/2024
Assessment Reference	1-M-N	**Prop Type Ref**	1-M-N Gas
Property			

SAP Rating	85 B	**DER**	11.85	**TER**	14.09
Environmental	90 B	**% DER < TER**			15.90
CO_2 Emissions (t/year)	0.81	**DFEE**	35.00	**TFEE**	41.79
Compliance Check	See BREL	**% DFEE < TFEE**			16.26
% DPER < TPER	7.34	**DPER**	68.87	**TPER**	74.32

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	72.0000 (1b)	x	3.0000 (2b)	=	216.0000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	216.0000	(5)

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2. Ventilation rate

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		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	0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		1.5000	(17)
Infiltration rate		0.0750	(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) =	0.0694	(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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		86.4000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			11.1300	0.8687	9.6689			(27)
Door			2.2000	1.1000	2.4200			(26)
Heatloss Floor 1			20.0000	0.1021	2.0427			(28b)
North	24.0000	1.5000	22.5000	0.1400	3.1500	110.0000	2475.0000	(29a)
South	24.0000	3.3000	20.7000	0.1400	2.8980	110.0000	2277.0000	(29a)
West	28.0000	6.3300	21.6700	0.1400	3.0338	110.0000	2383.7000	(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1100	2.8380	14.0000	361.2000	(29a)
Total net area of external elements Aum(A, m2)			124.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0514			(33)
Party Floor 1			47.0000			80.0000	3760.0000	(32d)
Party Ceiling			72.0000			100.0000	7200.0000	(32b)
Internal Wall 1			93.0000			9.0000	837.0000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		19293.9000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							267.9708	(35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E3 Sill	7.3000	0.0500	0.3650	
E4 Jamb	16.0000	0.0500	0.8000	
E20 Exposed floor (normal)	6.0000	0.3200	1.9200	
E7 Party floor between dwellings (in blocks of flats)	100.0000	0.0700	7.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.6300	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	36.6814	(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	11.1520	11.0284	10.9047	10.2866	10.1630	9.5448	9.5448	9.4212	9.7921	10.1630	10.4102	10.6575	(38)
Heat transfer coeff	47.8334	47.7098	47.5862	46.9680	46.8444	46.2263	46.2263	46.1026	46.4735	46.8444	47.0917	47.3389	(39)
Average = Sum(39)m / 12 =												46.9371	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6644	0.6626	0.6609	0.6523	0.6506	0.6420	0.6420	0.6403	0.6455	0.6506	0.6541	0.6575	(40)
HLP (average)												0.6519	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2937	(42)
Hot water usage for mixer showers	68.7304	67.6781	66.1274	63.7418	61.6044	58.6142	56.2491	59.0140	60.4047	63.3663	66.4507	68.6684	(42a)
Hot water usage for baths	26.4729	26.0733	25.5047	24.6534	23.8861	22.8298	22.0285	23.0084	23.5227	24.5692	25.6574	26.4519	(42b)
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
Average daily hot water use (litres/day)												122.5649	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.3229	130.4848	126.9794	122.3563	118.0655	112.6328	109.4664	114.5974	117.8884	123.2829	128.8415	133.2399	(44)
Energy conte	196.2743	172.6578	181.4510	159.8279	152.1393	130.2561	120.9636	134.8832	136.7447	158.8624	174.1336	195.6726	(45)
Energy content (annual)										Total = Sum(45)m =		1913.8664	
Distribution loss (46)m = 0.15 x (45)m	29.4411	25.8987	27.2176	23.9742	22.8209	19.5384	18.1445	20.2325	20.5117	23.8294	26.1200	29.3509	(46)
Water storage loss:													
Store volume												150.0000	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(64)
										Total per year (kWh/year) = Sum(64)m =		2542.5424	(64)
12Total per year (kWh/year)												2543	(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	107.9767	95.9905	103.0480	94.4804	93.3018	84.6477	82.9359	87.5642	86.8052	95.5373	99.2370	107.7766	(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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.0875	121.8826	110.0875	113.7571	110.0875	113.7571	110.0875	110.0875	113.7571	110.0875	113.7571	110.0875	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)	145.1300	142.8430	138.5053	131.2227	125.4057	117.5663	111.4730	117.6938	120.5628	128.4103	137.8292	144.8611	(72)
Total internal gains	517.5419	529.1453	507.7325	492.8788	469.2029	448.6972	430.0251	434.1506	445.9693	464.3878	491.6656	508.3638	(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	1.5000	10.6334	0.4000	0.7000	0.7700	3.0950	(74)
South	3.3000	46.7521	0.4000	0.7000	0.7700	29.9368	(78)
West	6.3300	19.6403	0.4000	0.7000	0.7700	24.1236	(80)

Solar gains	57.1554	102.1344	150.2211	200.0753	234.2111	236.2656	226.2770	200.6994	167.7122	115.9188	69.3827	48.2864	(83)

Total gains	574.6973	631.2796	657.9536	692.9541	703.4141	684.9629	656.3021	634.8500	613.6814	580.3066	561.0483	556.6502	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	112.0434	112.3337	112.6255	114.1078	114.4089	115.9388	115.9388	116.2497	115.3219	114.4089	113.8082	113.2138	
alpha	8.4696	8.4889	8.5084	8.6072	8.6273	8.7293	8.7293	8.7500	8.6881	8.6273	8.5872	8.5476	
util living area													
	0.9820	0.9601	0.9148	0.7887	0.6155	0.4318	0.3099	0.3340	0.5216	0.8029	0.9508	0.9853	(86)
MIT	20.6395	20.7508	20.8645	20.9664	20.9959	20.9998	21.0000	21.0000	20.9992	20.9673	20.8134	20.6200	(87)
Th 2	20.3724	20.3740	20.3755	20.3831	20.3847	20.3923	20.3923	20.3939	20.3893	20.3847	20.3816	20.3785	(88)
util rest of house													
	0.9771	0.9504	0.8964	0.7564	0.5762	0.3908	0.2671	0.2900	0.4759	0.7657	0.9374	0.9812	(89)
MIT 2	20.0537	20.1613	20.2670	20.3597	20.3823	20.3922	20.3923	20.3938	20.3889	20.3630	20.2283	20.0404	(90)
Living area fraction										fLA = Living area / (4) =		0.3889	(91)
MIT	20.2815	20.3905	20.4994	20.5957	20.6209	20.6285	20.6286	20.6296	20.6262	20.5980	20.4558	20.2658	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.1315	20.2405	20.3494	20.4457	20.4709	20.4785	20.4786	20.4796	20.4762	20.4480	20.3058	20.1158	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9749	0.9481	0.8956	0.7598	0.5817	0.3967	0.2732	0.2963	0.4824	0.7697	0.9356	0.9792	(94)
Useful gains	560.2449	598.4906	589.2402	526.4890	409.2059	271.6913	179.2933	188.0757	296.0502	446.6475	524.9032	545.0715	(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													
	757.2758	731.8936	659.0383	542.2765	410.8678	271.7425	179.2948	188.0789	296.3249	461.3243	621.8841	753.4360	(97)
Space heating kWh													
	146.5909	89.6469	51.9298	11.3670	1.2364	0.0000	0.0000	0.0000	0.0000	10.9195	69.8263	155.0232	(98a)
Space heating requirement - total per year (kWh/year)												536.5401	
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													
	146.5909	89.6469	51.9298	11.3670	1.2364	0.0000	0.0000	0.0000	0.0000	10.9195	69.8263	155.0232	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												536.5401	
Space heating per m2											(98c) / (4) =	7.4519	(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 %)												88.8000	(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													
	146.5909	89.6469	51.9298	11.3670	1.2364	0.0000	0.0000	0.0000	0.0000	10.9195	69.8263	155.0232	(98)
Space heating efficiency (main heating system 1)													
	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)													
	165.0799	100.9537	58.4795	12.8007	1.3924	0.0000	0.0000	0.0000	0.0000	12.2968	78.6332	174.5757	(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													
	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(64)
Efficiency of water heater												79.8000	(216)
(217)m	82.9085	82.2052	81.2919	80.2147	79.8484	79.8000	79.8000	79.8000	79.8000	80.1977	81.7571	83.0283	(217)
Fuel for water heating, kWh/month													
	301.1375	268.6994	288.8913	263.6674	257.4049	227.9800	218.4937	235.9368	236.1111	264.6670	276.1906	299.9784	(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	26.1043	23.5781	26.1043	25.2622	26.1043	25.2622	26.1043	26.1043	25.2622	26.1043	25.2622	26.1043	(231)
Lighting	21.2844	17.0751	15.3743	11.2638	8.7005	7.1084	7.9369	10.3167	13.4004	17.5820	19.8588	21.8759	(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												604.2119	(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												3139.1584	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)													
mechanical ventilation fans (SFP = 0.8400)												221.3568	(230a)
central heating pump												41.0000	(230c)

main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	307.3568	(231)
Electricity for lighting (calculated in Appendix L)	171.7772	(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	4222.5043	(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	604.2119	0.2100	126.8845	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3139.1584	0.2100	659.2233	(264)
Space and water heating			786.1078	(265)
Pumps, fans and electric keep-hot	307.3568	0.1387	42.6342	(267)
Energy for lighting	171.7772	0.1443	24.7928	(268)
Total CO2, kg/year			853.5347	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.8500	(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	604.2119	1.1300	682.7594	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3139.1584	1.1300	3547.2490	(278)
Space and water heating			4230.0084	(279)
Pumps, fans and electric keep-hot	307.3568	1.5128	464.9694	(281)
Energy for lighting	171.7772	1.5338	263.4776	(282)
Total Primary energy kWh/year			4958.4554	(286)
Dwelling Primary energy Rate (DPER)			68.8700	(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	72.0000	(1b)	x 3.0000	(2b) =	216.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		216.0000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.1389	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3889	(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) =	0.3597	(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	0.4586	0.4497	0.4407	0.3957	0.3867	0.3417	0.3417	0.3327	0.3597	0.3867	0.4047	0.4227	(22b)
Effective ac	0.6052	0.6011	0.5971	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5893	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			11.1300	1.1450	12.7443			(27)
Heatloss Floor 1			20.0000	0.1300	2.6000			(28b)
North	24.0000	1.5000	22.5000	0.1800	4.0500			(29a)
South	24.0000	3.3000	20.7000	0.1800	3.7260			(29a)
West	28.0000	6.3300	21.6700	0.1800	3.9006			(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1800	4.6440			(29a)
Total net area of external elements Aum(A, m2)			124.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.8649			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 247.9708 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3 Sill	7.3000	0.0500	0.3650
E4 Jamb	16.0000	0.0500	0.8000
E20 Exposed floor (normal)	6.0000	0.3200	1.9200
E7 Party floor between dwellings (in blocks of flats)	100.0000	0.0700	7.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.6300 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.4949 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.1371	42.8460	42.5606	41.2203	40.9695	39.8022	39.8022	39.5860	40.2518	40.9695	41.4768	42.0072	(38)
Heat transfer coeff	87.6320	87.3408	87.0555	85.7152	85.4644	84.2970	84.2970	84.0809	84.7467	85.4644	85.9717	86.5021	(39)
Average = Sum(39)m / 12 =												85.7140	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2171	1.2131	1.2091	1.1905	1.1870	1.1708	1.1708	1.1678	1.1770	1.1870	1.1941	1.2014	(40)
HLP (average)												1.1905	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2937 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.6772	61.7353	60.3627	57.7366	55.7986	53.6373	52.4088	53.7710	55.2642	57.5847	60.2673	62.4371	(42a)
Hot water usage for baths	27.0765	26.6744	26.1081	25.0640	24.2822	23.4152	22.9470	23.5093	24.1216	25.0492	26.1148	26.9849	(42b)
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
Average daily hot water use (litres/day)												117.5446	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.8733	125.1431	121.8181	116.7617	112.6557	108.2413	106.5446	109.8552	113.3469	117.9812	123.1155	127.5416	(44)
Energy conte	202.5201	178.2021	187.2299	159.8409	151.6562	133.0953	128.8565	136.0237	139.7680	160.0994	175.4006	199.6994	(45)
Energy content (annual)										Total = Sum(45)m =		1952.3920	
Distribution loss (46)m = 0.15 x (45)m	30.3780	26.7303	28.0845	23.9761	22.7484	19.9643	19.3285	20.4036	20.9652	24.0149	26.3101	29.9549	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.1150	220.2878	233.8248	204.9327	198.2511	178.1872	175.4514	182.6186	184.8599	206.6943	220.4925	246.2943	(62)
WWHRS	-28.6534	-25.3413	-26.5360	-21.9728	-20.4779	-17.5231	-16.4251	-17.4664	-18.1300	-21.3733	-24.2134	-28.1228	(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	220.4616	194.9465	207.2888	182.9599	177.7732	160.6641	159.0263	165.1522	166.7298	185.3210	196.2791	218.1715	(64)
										Total per year (kWh/year) = Sum(64)m =		2234.7740	(64)
12Total per year (kWh/year)												2235	(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	104.6138	92.9208	99.5299	89.2206	87.7016	80.3277	80.1207	82.5038	82.5463	90.5090	94.3942	103.6760	(65)

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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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.9910	118.4543	106.9910	110.5574	106.9910	110.5574	106.9910	106.9910	110.5574	106.9910	110.5574	106.9910	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)	140.6100	138.2750	133.7767	123.9175	117.8785	111.5662	107.6891	110.8922	114.6477	121.6518	131.1030	139.3494	(72)
Total internal gains	509.9255	521.1490	499.9074	482.3739	458.5793	439.4975	423.1448	424.2526	436.8545	454.5329	481.7397	499.7557	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.5000	10.6334	0.6300	0.7000	0.7700	4.8746	(74)
South	3.3000	46.7521	0.6300	0.7000	0.7700	47.1505	(78)
West	6.3300	19.6403	0.6300	0.7000	0.7700	37.9947	(80)

Solar gains	90.0198	160.8616	236.5982	315.1185	368.8825	372.1184	356.3862	316.1015	264.1466	182.5720	109.2778	76.0510	(83)
Total gains	599.9452	682.0106	736.5056	797.4924	827.4618	811.6159	779.5310	740.3541	701.0012	637.1049	591.0175	575.8067	(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	56.5937	56.7823	56.9685	57.8593	58.0290	58.8326	58.8326	58.9839	58.5205	58.0290	57.6866	57.3329	
alpha	4.7729	4.7855	4.7979	4.8573	4.8686	4.9222	4.9222	4.9323	4.9014	4.8686	4.8458	4.8222	
util living area	0.9916	0.9836	0.9671	0.9179	0.8125	0.6319	0.4693	0.5120	0.7476	0.9348	0.9831	0.9930	(86)
MIT	19.7143	19.9107	20.1847	20.5461	20.8176	20.9603	20.9924	20.9885	20.9095	20.5635	20.0873	19.6915	(87)
Th 2	19.9063	19.9096	19.9127	19.9276	19.9304	19.9434	19.9434	19.9459	19.9384	19.9304	19.9248	19.9189	(88)
util rest of house	0.9889	0.9785	0.9565	0.8914	0.7560	0.5409	0.3600	0.4000	0.6627	0.9079	0.9768	0.9908	(89)
MIT 2	18.4356	18.6862	19.0317	19.4803	19.7818	19.9216	19.9411	19.9420	19.8805	19.5122	18.9229	18.4155	(90)
Living area fraction									fLA = Living area / (4) =			0.3889	(91)
MIT	18.9329	19.1624	19.4801	19.8948	20.1846	20.3255	20.3500	20.3490	20.2807	19.9210	19.3757	18.9118	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9329	19.1624	19.4801	19.8948	20.1846	20.3255	20.3500	20.3490	20.2807	19.9210	19.3757	18.9118	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9856	0.9739	0.9513	0.8905	0.7706	0.5751	0.4027	0.4437	0.6920	0.9076	0.9726	0.9879	(94)
Useful gains	591.3335	664.1884	700.6116	710.1476	637.6682	466.7653	313.8892	328.4956	485.1263	578.2642	574.8081	568.8538	(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	1282.3056	1245.6867	1129.9876	942.4230	725.1327	482.6459	316.1104	332.0339	523.7920	796.6168	1055.3631	1272.5968	(97)
Space heating kWh	514.0833	390.7668	319.4558	167.2382	65.0736	0.0000	0.0000	0.0000	0.0000	162.4543	345.9996	523.5848	(98a)
Space heating requirement - total per year (kWh/year)												2488.6565	
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	514.0833	390.7668	319.4558	167.2382	65.0736	0.0000	0.0000	0.0000	0.0000	162.4543	345.9996	523.5848	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2488.6565	
Space heating per m2										(98c) / (4) =		34.5647	(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	514.0833	390.7668	319.4558	167.2382	65.0736	0.0000	0.0000	0.0000	0.0000	162.4543	345.9996	523.5848	(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)	556.9700	423.3660	346.1059	181.1898	70.5023	0.0000	0.0000	0.0000	0.0000	176.0069	374.8642	567.2642	(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	220.4616	194.9465	207.2888	182.9599	177.7732	160.6641	159.0263	165.1522	166.7298	185.3210	196.2791	218.1715	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8926	85.5872	85.0263	83.8588	82.0277	79.8000	79.8000	79.8000	79.8000	83.7658	85.3172	85.9489	(217)
Fuel for water heating, kWh/month	256.6713	227.7752	243.7938	218.1761	216.7233	201.3335	199.2810	206.9577	208.9346	221.2371	230.0581	253.8387	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.2306	17.8342	16.0577	11.7646	9.0873	7.4244	8.2897	10.7753	13.9961	18.3636	20.7417	22.8485	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.4748	-35.6060	-52.7941	-61.2938	-67.7684	-63.8665	-63.0909	-58.7425	-51.3386	-41.5854	-27.2987	-21.0338	(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	-10.6659	-22.7391	-45.7593	-69.5549	-92.7759	-93.5095	-92.4024	-77.8603	-56.5795	-32.7828	-14.3258	-8.4113	(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	2696.2692	(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	2684.7803	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	179.4138	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1186.2601	(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	4460.2032	(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	2696.2692	0.2100	566.2165	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2684.7803	0.2100	563.8039	(264)
Space and water heating			1130.0204	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	179.4138	0.1443	25.8950	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.8934	0.1339	-76.1900	
PV Unit electricity exported	-617.3667	0.1255	-77.5087	
Total			-153.6988	(269)
Total CO2, kg/year			1014.1459	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.0900	(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	2696.2692	1.1300	3046.7842	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2684.7803	1.1300	3033.8018	(278)
Space and water heating			6080.5860	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	179.4138	1.5338	275.1909	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.8934	1.4949	-850.4577	
PV Unit electricity exported	-617.3667	0.4608	-284.5002	
Total			-1134.9579	(283)
Total Primary energy kWh/year			5350.9198	(286)
Target Primary Energy Rate (TPER)			74.3200	(287)

Summary for Input Data

elmhurst energy

Property Reference	1-M-S Gas	**Issued on Date**	05/02/2024
Assessment Reference	1-M- S Gas	**Prop Type Ref**	1-M-S Gas
Property			

SAP Rating	85 B	**DER**	11.98	**TER**	14.39
Environmental	90 B	**% DER < TER**			16.75
CO_2 Emissions (t/year)	0.81	**DFEE**	35.94	**TFEE**	43.18
Compliance Check	See BREL	**% DFEE < TFEE**			16.78
% DPER < TPER	8.42	**DPER**	69.55	**TPER**	75.94

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Mid-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	25.00 m	72.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	28.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	24.00	22.50	0.00	None	1.50	Enter Gross Area
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	24.00	20.70	0.00	None	3.30	Enter Gross Area
East	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	28.00	21.67	0.00	None	6.33	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	28.00	25.80	2.50	Stairwell Stairwell 2	2.20	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	93.00

10.1 Party Ceilings

Summary for Input Data

elmhurst energy

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling	Concrete floor slab, carpeted	100.00	72.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Exposed Floor - Solid	Lowest occupied	Other	0.11	Garage Single 1 Inside	0.70	0.00	20.00

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Concrete floor slab, carpeted	100.00	47.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
South	Window	South	South	1.50	0
East	Window	East	East	6.33	0
North	Window	North	North	3.30	0
Opening	Door	Wall to Common	North	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	8.50	0.05	0.05	No
E3 Sill	Independently assessed	7.30	0.05	0.05	No
E4 Jamb	Independently assessed	16.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	6.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	100.00	0.07	0.07	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	6.00	0.02	0.02	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Independently assessed	8.00	0.00	0.00	No

Y-value	0.09	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

Summary for Input Data

elmhurst energy

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	Manufacturer	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	102	
In Winter	88.80	
In Summer	79.80	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2106	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From header tank
Bath Count	1
Supplementary Immersion	No

Summary for Input Data

elmhurst energy

Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	1-M-S Gas	**Issued on Date**	05/02/2024
Assessment Reference	1-M- S Gas	**Prop Type Ref**	1-M-S Gas
Property			

SAP Rating	85 B	**DER**	11.98	**TER**	14.39
Environmental	90 B	**% DER < TER**			16.75
CO_2 Emissions (t/year)	0.81	**DFEE**	35.94	**TFEE**	43.18
Compliance Check	See BREL	**% DFEE < TFEE**			16.78
% DPER < TPER	8.42	**DPER**	69.55	**TPER**	75.94

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	72.0000	(1b)	x 3.0000	(2b) =	216.0000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		216.0000	(5)

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2. Ventilation rate

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		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	0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		1.5000	(17)
Infiltration rate		0.0750	(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) =	0.0694	(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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		86.4000 (23c)

Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			11.1300	0.8687	9.6689			(27)
Door			2.2000	1.1000	2.4200			(26)
Heatloss Floor 1			20.0000	0.1021	2.0427			(28b)
South	24.0000	1.5000	22.5000	0.1400	3.1500	110.0000	2475.0000	(29a)
North	24.0000	3.3000	20.7000	0.1400	2.8980	110.0000	2277.0000	(29a)
East	28.0000	6.3300	21.6700	0.1400	3.0338	110.0000	2383.7000	(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1100	2.8380	14.0000	361.2000	(29a)
Total net area of external elements Aum(A, m2)			124.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0514			(33)
Party Floor 1			47.0000			80.0000	3760.0000	(32d)
Party Ceiling			72.0000			100.0000	7200.0000	(32b)
Internal Wall 1			93.0000			9.0000	837.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19293.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		267.9708 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E3 Sill	7.3000	0.0500	0.3650	
E4 Jamb	16.0000	0.0500	0.8000	
E20 Exposed floor (normal)	6.0000	0.3200	1.9200	
E7 Party floor between dwellings (in blocks of flats)	100.0000	0.0700	7.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.6300	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	36.6814	(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	11.1520	11.0284	10.9047	10.2866	10.1630	9.5448	9.5448	9.4212	9.7921	10.1630	10.4102	10.6575	(38)
Heat transfer coeff	47.8334	47.7098	47.5862	46.9680	46.8444	46.2263	46.2263	46.1026	46.4735	46.8444	47.0917	47.3389	(39)
Average = Sum(39)m / 12 =												46.9371	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6644	0.6626	0.6609	0.6523	0.6506	0.6420	0.6420	0.6403	0.6455	0.6506	0.6541	0.6575	(40)
HLP (average)												0.6519	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2937	(42)
Hot water usage for mixer showers	68.7304	67.6781	66.1274	63.7418	61.6044	58.6142	56.2491	59.0140	60.4047	63.3663	66.4507	68.6684	(42a)
Hot water usage for baths	26.4729	26.0733	25.5047	24.6534	23.8861	22.8298	22.0285	23.0084	23.5227	24.5692	25.6574	26.4519	(42b)
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
Average daily hot water use (litres/day)												122.5649	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.3229	130.4848	126.9794	122.3563	118.0655	112.6328	109.4664	114.5974	117.8884	123.2829	128.8415	133.2399	(44)
Energy conte	196.2743	172.6578	181.4510	159.8279	152.1393	130.2561	120.9636	134.8832	136.7447	158.8624	174.1336	195.6726	(45)
Energy content (annual)										Total = Sum(45)m =		1913.8664	
Distribution loss (46)m = 0.15 x (45)m	29.4411	25.8987	27.2176	23.9742	22.8209	19.5384	18.1445	20.2325	20.5117	23.8294	26.1200	29.3509	(46)
Water storage loss:													
Store volume												150.0000	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(64)
										Total per year (kWh/year) = Sum(64)m =		2542.5424	(64)
12Total per year (kWh/year)												2543	(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	107.9767	95.9905	103.0480	94.4804	93.3018	84.6477	82.9359	87.5642	86.8052	95.5373	99.2370	107.7766	(65)

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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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.0875	121.8826	110.0875	113.7571	110.0875	113.7571	110.0875	110.0875	113.7571	110.0875	113.7571	110.0875	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)	145.1300	142.8430	138.5053	131.2227	125.4057	117.5663	111.4730	117.6938	120.5628	128.4103	137.8292	144.8611	(72)
Total internal gains	517.5419	529.1453	507.7325	492.8788	469.2029	448.6972	430.0251	434.1506	445.9693	464.3878	491.6656	508.3638	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.3000	10.6334	0.4000	0.7000	0.7700	6.8089	(74)
East	6.3300	19.6403	0.4000	0.7000	0.7700	24.1236	(76)
South	1.5000	46.7521	0.4000	0.7000	0.7700	13.6077	(78)

Solar gains	44.5402	82.4889	128.2157	180.9457	220.1860	225.5911	214.6339	184.7557	146.6269	95.5226	54.6087	37.2726	(83)

Total gains	562.0821	611.6342	635.9482	673.8245	689.3889	674.2883	644.6590	618.9064	592.5962	559.9105	546.2742	545.6364	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	112.0434	112.3337	112.6255	114.1078	114.4089	115.9388	115.9388	116.2497	115.3219	114.4089	113.8082	113.2138	
alpha	8.4696	8.4889	8.5084	8.6072	8.6273	8.7293	8.7293	8.7500	8.6881	8.6273	8.5872	8.5476	
util living area													
	0.9843	0.9667	0.9275	0.8055	0.6275	0.4386	0.3155	0.3426	0.5399	0.8240	0.9575	0.9871	(86)
MIT	20.6225	20.7280	20.8459	20.9607	20.9952	20.9998	21.0000	21.0000	20.9989	20.9602	20.7974	20.6048	(87)
Th 2	20.3724	20.3740	20.3755	20.3831	20.3847	20.3923	20.3923	20.3939	20.3893	20.3847	20.3816	20.3785	(88)
util rest of house													
	0.9800	0.9583	0.9108	0.7738	0.5876	0.3970	0.2719	0.2975	0.4927	0.7877	0.9455	0.9835	(89)
MIT 2	20.0373	20.1400	20.2508	20.3555	20.3819	20.3922	20.3923	20.3938	20.3888	20.3580	20.2138	20.0256	(90)
Living area fraction										fLA = Living area / (4) =		0.3889	(91)
MIT	20.2649	20.3686	20.4822	20.5908	20.6204	20.6285	20.6286	20.6296	20.6260	20.5922	20.4407	20.2509	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.1149	20.2186	20.3322	20.4408	20.4704	20.4785	20.4786	20.4796	20.4760	20.4422	20.2907	20.1009	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9779	0.9559	0.9096	0.7769	0.5932	0.4029	0.2781	0.3039	0.4994	0.7913	0.9435	0.9816	(94)
Useful gains	549.6647	584.6499	578.4312	523.4638	408.9234	271.6837	179.2930	188.0749	295.9571	443.0439	515.4209	535.5757	(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													
	756.4805	730.8493	658.2223	542.0496	410.8456	271.7419	179.2948	188.0788	296.3169	461.0509	621.1739	752.7300	(97)
Space heating kWh													
	153.8709	98.2460	59.3646	13.3818	1.4302	0.0000	0.0000	0.0000	0.0000	13.3972	76.1422	161.5628	(98a)
Space heating requirement - total per year (kWh/year)												577.3956	
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													
	153.8709	98.2460	59.3646	13.3818	1.4302	0.0000	0.0000	0.0000	0.0000	13.3972	76.1422	161.5628	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												577.3956	
Space heating per m2											(98c) / (4) =	8.0194	(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 %)												88.8000	(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													
	153.8709	98.2460	59.3646	13.3818	1.4302	0.0000	0.0000	0.0000	0.0000	13.3972	76.1422	161.5628	(98)
Space heating efficiency (main heating system 1)													
	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)													
	173.2781	110.6373	66.8520	15.0695	1.6105	0.0000	0.0000	0.0000	0.0000	15.0869	85.7457	181.9401	(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													
	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.0079	82.3701	81.4660	80.2842	79.8559	79.8000	79.8000	79.8000	79.8000	80.2831	81.8930	83.1143	(217)
Fuel for water heating, kWh/month													
	300.7771	268.1618	288.2741	263.4390	257.3806	227.9800	218.4937	235.9368	236.1111	264.3855	275.7324	299.6679	(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	26.1043	23.5781	26.1043	25.2622	26.1043	25.2622	26.1043	26.1043	25.2622	26.1043	25.2622	26.1043	(231)
Lighting	21.2844	17.0751	15.3743	11.2638	8.7005	7.1084	7.9369	10.3167	13.4004	17.5820	19.8588	21.8759	(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												650.2203	(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												3136.3401	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)													
mechanical ventilation fans (SFP = 0.8400)												221.3568	(230a)
central heating pump												41.0000	(230c)

main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	307.3568	(231)
Electricity for lighting (calculated in Appendix L)	171.7772	(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	4265.6944	(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	650.2203	0.2100	136.5463	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3136.3401	0.2100	658.6314	(264)
Space and water heating			795.1777	(265)
Pumps, fans and electric keep-hot	307.3568	0.1387	42.6342	(267)
Energy for lighting	171.7772	0.1443	24.7928	(268)
Total CO2, kg/year			862.6046	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.9800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	650.2203	1.1300	734.7489	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3136.3401	1.1300	3544.0643	(278)
Space and water heating			4278.8133	(279)
Pumps, fans and electric keep-hot	307.3568	1.5128	464.9694	(281)
Energy for lighting	171.7772	1.5338	263.4776	(282)
Total Primary energy kWh/year			5007.2603	(286)
Dwelling Primary energy Rate (DPER)			69.5500	(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	72.0000	(1b)	x 3.0000	(2b) =	216.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 72.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		216.0000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	3 * 10 = 30.0000	(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) =	30.0000 / (5) = 0.1389	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3889	(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) = 0.3597	(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	0.4586	0.4497	0.4407	0.3957	0.3867	0.3417	0.3417	0.3327	0.3597	0.3867	0.4047	0.4227	(22b)
Effective ac	0.6052	0.6011	0.5971	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5893	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			11.1300	1.1450	12.7443			(27)
Heatloss Floor 1			20.0000	0.1300	2.6000			(28b)
South	24.0000	1.5000	22.5000	0.1800	4.0500			(29a)
North	24.0000	3.3000	20.7000	0.1800	3.7260			(29a)
East	28.0000	6.3300	21.6700	0.1800	3.9006			(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1800	4.6440			(29a)
Total net area of external elements Aum(A, m2)			124.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.8649			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 247.9708 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3 Sill	7.3000	0.0500	0.3650
E4 Jamb	16.0000	0.0500	0.8000
E20 Exposed floor (normal)	6.0000	0.3200	1.9200
E7 Party floor between dwellings (in blocks of flats)	100.0000	0.0700	7.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.6300 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.4949 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.1371	42.8460	42.5606	41.2203	40.9695	39.8022	39.8022	39.5860	40.2518	40.9695	41.4768	42.0072	(38)
Heat transfer coeff	87.6320	87.3408	87.0555	85.7152	85.4644	84.2970	84.2970	84.0809	84.7467	85.4644	85.9717	86.5021	(39)
Average = Sum(39)m / 12 =												85.7140	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2171	1.2131	1.2091	1.1905	1.1870	1.1708	1.1708	1.1678	1.1770	1.1870	1.1941	1.2014	(40)
HLP (average)												1.1905	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2937 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.6772	61.7353	60.3627	57.7366	55.7986	53.6373	52.4088	53.7710	55.2642	57.5847	60.2673	62.4371	(42a)
Hot water usage for baths	27.0765	26.6744	26.1081	25.0640	24.2822	23.4152	22.9470	23.5093	24.1216	25.0492	26.1148	26.9849	(42b)
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
Average daily hot water use (litres/day)												117.5446	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.8733	125.1431	121.8181	116.7617	112.6557	108.2413	106.5446	109.8552	113.3469	117.9812	123.1155	127.5416	(44)
Energy conte	202.5201	178.2021	187.2299	159.8409	151.6562	133.0953	128.8565	136.0237	139.7680	160.0994	175.4006	199.6994	(45)
Energy content (annual)										Total = Sum(45)m =		1952.3920	
Distribution loss (46)m = 0.15 x (45)m	30.3780	26.7303	28.0845	23.9761	22.7484	19.9643	19.3285	20.4036	20.9652	24.0149	26.3101	29.9549	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.1150	220.2878	233.8248	204.9327	198.2511	178.1872	175.4514	182.6186	184.8599	206.6943	220.4925	246.2943	(62)
WWHRS	-28.6534	-25.3413	-26.5360	-21.9728	-20.4779	-17.5231	-16.4251	-17.4664	-18.1300	-21.3733	-24.2134	-28.1228	(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	220.4616	194.9465	207.2888	182.9599	177.7732	160.6641	159.0263	165.1522	166.7298	185.3210	196.2791	218.1715	(64)
										Total per year (kWh/year) = Sum(64)m =		2234.7740	(64)
12Total per year (kWh/year)												2235	(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	104.6138	92.9208	99.5299	89.2206	87.7016	80.3277	80.1207	82.5038	82.5463	90.5090	94.3942	103.6760	(65)

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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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.9910	118.4543	106.9910	110.5574	106.9910	110.5574	106.9910	106.9910	110.5574	106.9910	110.5574	106.9910	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)	140.6100	138.2750	133.7767	123.9175	117.8785	111.5662	107.6891	110.8922	114.6477	121.6518	131.1030	139.3494	(72)
Total internal gains	509.9255	521.1490	499.9074	482.3739	458.5793	439.4975	423.1448	424.2526	436.8545	454.5329	481.7397	499.7557	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.3000	10.6334	0.6300	0.7000	0.7700	10.7240	(74)
East	6.3300	19.6403	0.6300	0.7000	0.7700	37.9947	(76)
South	1.5000	46.7521	0.6300	0.7000	0.7700	21.4321	(78)

Solar gains	70.1508	129.9200	201.9398	284.9894	346.7929	355.3059	338.0483	290.9903	230.9374	150.4481	86.0087	58.7043	(83)
Total gains	580.0762	651.0690	701.8471	767.3633	805.3722	794.8034	761.1931	715.2429	667.7919	604.9810	567.7484	558.4600	(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	56.5937	56.7823	56.9685	57.8593	58.0290	58.8326	58.8326	58.9839	58.5205	58.0290	57.6866	57.3329	
alpha	4.7729	4.7855	4.7979	4.8573	4.8686	4.9222	4.9222	4.9323	4.9014	4.8686	4.8458	4.8222	
util living area	0.9927	0.9864	0.9725	0.9274	0.8241	0.6428	0.4799	0.5285	0.7711	0.9452	0.9856	0.9939	(86)
MIT	19.6861	19.8683	20.1406	20.5158	20.8048	20.9573	20.9916	20.9869	20.8959	20.5282	20.0554	19.6666	(87)
Th 2	19.9063	19.9096	19.9127	19.9276	19.9304	19.9434	19.9434	19.9459	19.9384	19.9304	19.9248	19.9189	(88)
util rest of house	0.9903	0.9820	0.9634	0.9030	0.7690	0.5512	0.3685	0.4136	0.6877	0.9216	0.9801	0.9919	(89)
MIT 2	18.3998	18.6330	18.9778	19.4461	19.7699	19.9198	19.9409	19.9414	19.8704	19.4723	18.8831	18.3840	(90)
Living area fraction									fLA = Living area / (4) =			0.3889	(91)
MIT	18.9000	19.1134	19.4300	19.8621	20.1724	20.3232	20.3495	20.3480	20.2692	19.8829	19.3390	18.8828	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9000	19.1134	19.4300	19.8621	20.1724	20.3232	20.3495	20.3480	20.2692	19.8829	19.3390	18.8828	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9873	0.9778	0.9583	0.9013	0.7827	0.5855	0.4120	0.4584	0.7159	0.9203	0.9762	0.9893	(94)
Useful gains	572.7301	636.6144	672.5575	691.6318	630.3411	465.3180	313.6155	327.8702	478.0604	556.7771	554.2322	552.4580	(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	1279.4287	1241.4077	1125.6273	939.6190	724.0861	482.4528	316.0720	331.9478	522.8206	793.3591	1052.2099	1270.0911	(97)
Space heating kWh	525.7838	406.4211	337.0839	178.5508	69.7463	0.0000	0.0000	0.0000	0.0000	176.0170	358.5439	533.9190	(98a)
Space heating requirement - total per year (kWh/year)												2586.0659	
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	525.7838	406.4211	337.0839	178.5508	69.7463	0.0000	0.0000	0.0000	0.0000	176.0170	358.5439	533.9190	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2586.0659	
Space heating per m2										(98c) / (4) =		35.9176	(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	525.7838	406.4211	337.0839	178.5508	69.7463	0.0000	0.0000	0.0000	0.0000	176.0170	358.5439	533.9190	(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)	569.6465	440.3263	365.2047	193.4461	75.5647	0.0000	0.0000	0.0000	0.0000	190.7010	388.4550	578.4605	(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	220.4616	194.9465	207.2888	182.9599	177.7732	160.6641	159.0263	165.1522	166.7298	185.3210	196.2791	218.1715	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9367	85.6679	85.1435	84.0051	82.1460	79.8000	79.8000	79.8000	79.8000	83.9444	85.3929	85.9868	(217)
Fuel for water heating, kWh/month	256.5395	227.5607	243.4583	217.7962	216.4113	201.3335	199.2810	206.9577	208.9346	220.7663	229.8540	253.7267	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.2306	17.8342	16.0577	11.7646	9.0873	7.4244	8.2897	10.7753	13.9961	18.3636	20.7417	22.8485	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.4748	-35.6060	-52.7941	-61.2938	-67.7684	-63.8665	-63.0909	-58.7425	-51.3386	-41.5854	-27.2987	-21.0338	(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	-10.6659	-22.7391	-45.7593	-69.5549	-92.7759	-93.5095	-92.4024	-77.8603	-56.5795	-32.7828	-14.3258	-8.4113	(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	2801.8048	(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	2682.6199	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	179.4138	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1186.2601	(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	4563.5784	(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	2801.8048	0.2100	588.3790	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2682.6199	0.2100	563.3502	(264)
Space and water heating			1151.7292	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	179.4138	0.1443	25.8950	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.8934	0.1339	-76.1900	
PV Unit electricity exported	-617.3667	0.1255	-77.5087	
Total			-153.6988	(269)
Total CO2, kg/year			1035.8546	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.3900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2801.8048	1.1300	3166.0395	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2682.6199	1.1300	3031.3604	(278)
Space and water heating			6197.3999	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	179.4138	1.5338	275.1909	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.8934	1.4949	-850.4577	
PV Unit electricity exported	-617.3667	0.4608	-284.5002	
Total			-1134.9579	(283)
Total Primary energy kWh/year			5467.7337	(286)
Target Primary Energy Rate (TPER)			75.9400	(287)

Summary for Input Data

elmhurst energy

Property Reference	1-T-N Gas	**Issued on Date**	05/02/2024
Assessment Reference	1-T-N Gas	**Prop Type Ref**	1-T-N Gas
Property			

SAP Rating	83 B	**DER**	15.53	**TER**	17.41
Environmental	88 B	**% DER < TER**			10.80
CO_2 Emissions (t/year)	1.03	**DFEE**	51.41	**TFEE**	56.98
Compliance Check	See BREL	**% DFEE < TFEE**			9.77
% DPER < TPER	3.86	**DPER**	88.63	**TPER**	92.19

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Top-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	25.00 m	72.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	28.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	24.00	22.50	0.00	None	1.50	Enter Gross Area
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	24.00	20.70	0.00	None	3.30	Enter Gross Area
West	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	28.00	21.67	0.00	None	6.33	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	28.00	25.80	2.50	Stairwell Stairwell 2	2.20	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	93.00

10.0 External Roofs

Summary for Input Data

elmhurst energy

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	73.00	73.00	None	0.00	Enter Gross Area	0.00

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Concrete floor slab, carpeted	100.00	73.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
North	Window	North	North	1.50	0
Opening	Window	West	West	6.33	0
Opening	Window	South	South	3.30	0
Opening	Door	Wall to Common	North	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	8.50	0.05	0.05	No
E3 Sill	Independently assessed	7.30	0.05	0.05	No
E4 Jamb	Independently assessed	16.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	6.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	50.00	0.07	0.07	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	6.00	0.02	0.02	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Independently assessed	8.00	0.00	0.00	No
E15 Flat roof with parapet	Independently assessed	34.00	0.56	0.56	No

Y-value	0.15	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues	
21.0 Fixed Cooling System	No

Summary for Input Data

elmhurst energy

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	Manufacturer	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	102	
In Winter	88.80	
In Summer	79.80	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2106	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	

25.0 Main Heating 2	None

26.0 Heat Networks	None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From header tank
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

Summary for Input Data

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	1-T-N Gas	**Issued on Date**	05/02/2024
Assessment Reference	1-T-N Gas	**Prop Type Ref**	1-T-N Gas
Property			

SAP Rating	83 B	**DER**	15.53	**TER**	17.41
Environmental	88 B	**% DER < TER**			10.80
CO_2 Emissions (t/year)	1.03	**DFEE**	51.41	**TFEE**	56.98
Compliance Check	See BREL	**% DFEE < TFEE**			9.77
% DPER < TPER	3.86	**DPER**	88.63	**TPER**	92.19

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	72.0000	(1b)	x 3.0000	(2b) =	216.0000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		216.0000	(5)

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2. Ventilation rate

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		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	0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		1.5000	(17)
Infiltration rate		0.0750	(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) =	0.0694	(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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		86.4000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			11.1300	0.8687	9.6689			(27)
Door			2.2000	1.1000	2.4200			(26)
North	24.0000	1.5000	22.5000	0.1400	3.1500	110.0000	2475.0000	(29a)
South	24.0000	3.3000	20.7000	0.1400	2.8980	110.0000	2277.0000	(29a)
West	28.0000	6.3300	21.6700	0.1400	3.0338	110.0000	2383.7000	(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1100	2.8380	14.0000	361.2000	(29a)
External Roof 1	73.0000		73.0000	0.1100	8.0300	9.0000	657.0000	(30)
Total net area of external elements Aum(A, m2)			177.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.0387			(33)
Party Floor 1			73.0000			80.0000	5840.0000	(32d)
Internal Wall 1			93.0000			9.0000	837.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 14830.9000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	205.9847	(35)
List of Thermal Bridges		

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3 Sill	7.3000	0.0500	0.3650
E4 Jamb	16.0000	0.0500	0.8000
E20 Exposed floor (normal)	6.0000	0.3200	1.9200
E7 Party floor between dwellings (in blocks of flats)	50.0000	0.0700	3.5000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0000	0.0000	0.0000
E15 Flat roof with parapet	34.0000	0.5600	19.0400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 26.1700 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 58.2087 (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	11.1520	11.0284	10.9047	10.2866	10.1630	9.5448	9.5448	9.4212	9.7921	10.1630	10.4102	10.6575	(38)
Heat transfer coeff	69.3607	69.2371	69.1134	68.4953	68.3717	67.7536	67.7536	67.6299	68.0008	68.3717	68.6189	68.8662	(39)
Average = Sum(39)m / 12 =												68.4644	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9633	0.9616	0.9599	0.9513	0.9496	0.9410	0.9410	0.9393	0.9445	0.9496	0.9530	0.9565	(40)
HLP (average)												0.9509	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2937 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.7304	67.6781	66.1274	63.7418	61.6044	58.6142	56.2491	59.0140	60.4047	63.3663	66.4507	68.6684	(42a)
Hot water usage for baths	26.4729	26.0733	25.5047	24.6534	23.8861	22.8298	22.0285	23.0084	23.5227	24.5692	25.6574	26.4519	(42b)
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
Average daily hot water use (litres/day)												122.5649	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.3229	130.4848	126.9794	122.3563	118.0655	112.6328	109.4664	114.5974	117.8884	123.2829	128.8415	133.2399	(44)
Energy conte	196.2743	172.6578	181.4510	159.8279	152.1393	130.2561	120.9636	134.8832	136.7447	158.8624	174.1336	195.6726	(45)
Energy content (annual)										Total = Sum(45)m =		1913.8664	
Distribution loss (46)m = 0.15 x (45)m	29.4411	25.8987	27.2176	23.9742	22.8209	19.5384	18.1445	20.2325	20.5117	23.8294	26.1200	29.3509	(46)
Water storage loss:													
Store volume												150.0000	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(64)
										Total per year (kWh/year) = Sum(64)m =		2542.5424	(64)
12Total per year (kWh/year)												2543	(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	107.9767	95.9905	103.0480	94.4804	93.3018	84.6477	82.9359	87.5642	86.8052	95.5373	99.2370	107.7766	(65)

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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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.0875	121.8826	110.0875	113.7571	110.0875	113.7571	110.0875	110.0875	113.7571	110.0875	113.7571	110.0875	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)	145.1300	142.8430	138.5053	131.2227	125.4057	117.5663	111.4730	117.6938	120.5628	128.4103	137.8292	144.8611	(72)
Total internal gains	517.5419	529.1453	507.7325	492.8788	469.2029	448.6972	430.0251	434.1506	445.9693	464.3878	491.6656	508.3638	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.5000	10.6334	0.4000	0.7000	0.7700	3.0950	(74)
South	3.3000	46.7521	0.4000	0.7000	0.7700	29.9368	(78)
West	6.3300	19.6403	0.4000	0.7000	0.7700	24.1236	(80)

Solar gains	57.1554	102.1344	150.2211	200.0753	234.2111	236.2656	226.2770	200.6994	167.7122	115.9188	69.3827	48.2864	(83)

Total gains	574.6973	631.2796	657.9536	692.9541	703.4141	684.9629	656.3021	634.8500	613.6814	580.3066	561.0483	556.6502	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.3952	59.5013	59.6077	60.1456	60.2544	60.8041	60.8041	60.9153	60.5830	60.2544	60.0373	59.8217	
alpha	4.9597	4.9668	4.9738	5.0097	5.0170	5.0536	5.0536	5.0610	5.0389	5.0170	5.0025	4.9881	
util living area	0.9842	0.9734	0.9539	0.8986	0.7891	0.6085	0.4496	0.4832	0.7066	0.9060	0.9698	0.9863	(86)
MIT	19.9327	20.0989	20.3251	20.6278	20.8540	20.9695	20.9945	20.9921	20.9356	20.6653	20.2606	19.9037	(87)
Th 2	20.1140	20.1154	20.1169	20.1241	20.1255	20.1328	20.1328	20.1342	20.1299	20.1255	20.1226	20.1198	(88)
util rest of house	0.9803	0.9669	0.9425	0.8737	0.7411	0.5352	0.3633	0.3955	0.6363	0.8780	0.9614	0.9830	(89)
MIT 2	19.1533	19.3173	19.5384	19.8292	20.0266	20.1178	20.1311	20.1316	20.0945	19.8694	19.4833	19.1294	(90)
Living area fraction										fLA = Living area / (4) =		0.3889	(91)
MIT	19.4564	19.6212	19.8444	20.1398	20.3484	20.4490	20.4669	20.4663	20.4216	20.1789	19.7856	19.4305	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.3064	19.4712	19.6944	19.9898	20.1984	20.2990	20.3169	20.3163	20.2716	20.0289	19.6356	19.2805	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9758	0.9612	0.9360	0.8694	0.7454	0.5497	0.3818	0.4143	0.6484	0.8744	0.9556	0.9788	(94)
Useful gains	560.7652	606.7649	615.8239	602.4606	524.3440	376.5299	250.6002	262.9975	397.9302	507.4170	536.1238	544.8571	(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	1040.8551	1008.8706	911.9075	759.5965	581.0504	386.1285	251.8303	264.8564	419.6752	644.6722	860.1797	1038.5365	(97)
Space heating kWh	357.1868	270.2151	220.2862	113.1378	42.1895	0.0000	0.0000	0.0000	0.0000	102.1179	233.3202	367.2975	(98a)
Space heating requirement - total per year (kWh/year)												1705.7510	
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	357.1868	270.2151	220.2862	113.1378	42.1895	0.0000	0.0000	0.0000	0.0000	102.1179	233.3202	367.2975	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1705.7510	
Space heating per m2											(98c) / (4) =	23.6910	(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 %)												88.8000	(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	357.1868	270.2151	220.2862	113.1378	42.1895	0.0000	0.0000	0.0000	0.0000	102.1179	233.3202	367.2975	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	402.2374	304.2963	248.0701	127.4074	47.5107	0.0000	0.0000	0.0000	0.0000	114.9976	262.7480	413.6233	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8624	84.5129	83.9165	82.7219	81.2016	79.8000	79.8000	79.8000	79.8000	82.5166	84.1333	84.9294	(217)
Fuel for water heating, kWh/month	294.2042	261.3624	279.8561	255.6760	253.1152	227.9800	218.4937	235.9368	236.1111	257.2293	268.3903	293.2635	(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	26.1043	23.5781	26.1043	25.2622	26.1043	25.2622	26.1043	26.1043	25.2622	26.1043	25.2622	26.1043	(231)
Lighting	21.2844	17.0751	15.3743	11.2638	8.7005	7.1084	7.9369	10.3167	13.4004	17.5820	19.8588	21.8759	(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												1920.8908	(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												3081.6186	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)													
mechanical ventilation fans (SFP = 0.8400)												221.3568	(230a)
central heating pump												41.0000	(230c)

main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	307.3568	(231)
Electricity for lighting (calculated in Appendix L)	171.7772	(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	5481.6433	(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	1920.8908	0.2100	403.3871	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3081.6186	0.2100	647.1399	(264)
Space and water heating			1050.5270	(265)
Pumps, fans and electric keep-hot	307.3568	0.1387	42.6342	(267)
Energy for lighting	171.7772	0.1443	24.7928	(268)
Total CO2, kg/year			1117.9539	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.5300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1920.8908	1.1300	2170.6066	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3081.6186	1.1300	3482.2290	(278)
Space and water heating			5652.8355	(279)
Pumps, fans and electric keep-hot	307.3568	1.5128	464.9694	(281)
Energy for lighting	171.7772	1.5338	263.4776	(282)
Total Primary energy kWh/year			6381.2825	(286)
Dwelling Primary energy Rate (DPER)			88.6300	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	72.0000	(1b)	x 3.0000	(2b) =	216.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 72.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		216.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.1389	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3889	(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) =	0.3597	(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	0.4586	0.4497	0.4407	0.3957	0.3867	0.3417	0.3417	0.3327	0.3597	0.3867	0.4047	0.4227	(22b)
Effective ac	0.6052	0.6011	0.5971	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5893	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			11.1300	1.1450	12.7443			(27)
North	24.0000	1.5000	22.5000	0.1800	4.0500			(29a)
South	24.0000	3.3000	20.7000	0.1800	3.7260			(29a)
West	28.0000	6.3300	21.6700	0.1800	3.9006			(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1800	4.6440			(29a)
External Roof 1	73.0000		73.0000	0.1100	8.0300			(30)
Total net area of external elements Aum(A, m2)			177.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.2949			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 205.9847 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3 Sill	7.3000	0.0500	0.3650
E4 Jamb	16.0000	0.0500	0.8000
E20 Exposed floor (normal)	6.0000	0.3200	1.9200
E7 Party floor between dwellings (in blocks of flats)	50.0000	0.0700	3.5000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0000	0.0000	0.0000
E15 Flat roof with parapet	34.0000	0.5600	19.0400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 26.1700 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 65.4649 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.1371	42.8460	42.5606	41.2203	40.9695	39.8022	39.8022	39.5860	40.2518	40.9695	41.4768	42.0072	(38)
Heat transfer coeff	108.6020	108.3108	108.0255	106.6852	106.4344	105.2670	105.2670	105.0509	105.7167	106.4344	106.9417	107.4721	(39)

Average = Sum(39)m / 12 = 106.6840

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5084	1.5043	1.5004	1.4817	1.4783	1.4620	1.4620	1.4590	1.4683	1.4783	1.4853	1.4927	(40)
HLP (average)												1.4817	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2937 (42)

Hot water usage for mixer showers												
	62.6772	61.7353	60.3627	57.7366	55.7986	53.6373	52.4088	53.7710	55.2642	57.5847	60.2673	62.4371 (42a)
Hot water usage for baths												
	27.0765	26.6744	26.1081	25.0640	24.2822	23.4152	22.9470	23.5093	24.1216	25.0492	26.1148	26.9849 (42b)
Hot water usage for other uses												
	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196 (42c)

Average daily hot water use (litres/day) 117.5446 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	127.8733	125.1431	121.8181	116.7617	112.6557	108.2413	106.5446	109.8552	113.3469	117.9812	123.1155	127.5416	(44)
Energy conte	202.5201	178.2021	187.2299	159.8409	151.6562	133.0953	128.8565	136.0237	139.7680	160.0994	175.4006	199.6994	(45)

Energy content (annual) Total = Sum(45)m = 1952.3920

Distribution loss (46)m = 0.15 x (45)m												
	30.3780	26.7303	28.0845	23.9761	22.7484	19.9643	19.3285	20.4036	20.9652	24.0149	26.3101	29.9549 (46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)
Total storage loss

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	249.1150	220.2878	233.8248	204.9327	198.2511	178.1872	175.4514	182.6186	184.8599	206.6943	220.4925	246.2943 (62)
WWHRS	-28.6534	-25.3413	-26.5360	-21.9728	-20.4779	-17.5231	-16.4251	-17.4664	-18.1300	-21.3733	-24.2134	-28.1228 (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												
	220.4616	194.9465	207.2888	182.9599	177.7732	160.6641	159.0263	165.1522	166.7298	185.3210	196.2791	218.1715 (64)

Total per year (kWh/year) = Sum(64)m = 2234.7740 (64)

12Total per year (kWh/year) 2235 (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												
	104.6138	92.9208	99.5299	89.2206	87.7016	80.3277	80.1207	82.5038	82.5463	90.5090	94.3942	103.6760 (65)

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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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	106.9910	118.4543	106.9910	110.5574	106.9910	110.5574	106.9910	106.9910	110.5574	106.9910	110.5574	106.9910	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)													
	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)													
	140.6100	138.2750	133.7767	123.9175	117.8785	111.5662	107.6891	110.8922	114.6477	121.6518	131.1030	139.3494	(72)
Total internal gains													
	509.9255	521.1490	499.9074	482.3739	458.5793	439.4975	423.1448	424.2526	436.8545	454.5329	481.7397	499.7557	(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	1.5000	10.6334	0.6300	0.7000	0.7700	4.8746	(74)
South	3.3000	46.7521	0.6300	0.7000	0.7700	47.1505	(78)
West	6.3300	19.6403	0.6300	0.7000	0.7700	37.9947	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	90.0198	160.8616	236.5982	315.1185	368.8825	372.1184	356.3862	316.1015	264.1466	182.5720	109.2778	76.0510	(83)
Total gains	599.9452	682.0106	736.5056	797.4924	827.4618	811.6159	779.5310	740.3541	701.0012	637.1049	591.0175	575.8067	(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	37.9339	38.0358	38.1363	38.6154	38.7064	39.1357	39.1357	39.2162	38.9692	38.7064	38.5228	38.3327	
alpha	3.5289	3.5357	3.5424	3.5744	3.5804	3.6090	3.6090	3.6144	3.5979	3.5804	3.5682	3.5555	
util living area	0.9864	0.9777	0.9622	0.9232	0.8457	0.7051	0.5537	0.5963	0.7978	0.9362	0.9772	0.9882	(86)
MIT	19.0357	19.2671	19.6189	20.1036	20.5310	20.8354	20.9488	20.9322	20.7242	20.1744	19.5321	19.0060	(87)
Th 2	19.6812	19.6843	19.6872	19.7012	19.7038	19.7161	19.7161	19.7184	19.7114	19.7038	19.6985	19.6930	(88)
util rest of house	0.9826	0.9713	0.9509	0.8985	0.7929	0.6037	0.4099	0.4540	0.7131	0.9106	0.9696	0.9849	(89)
MIT 2	17.4513	17.7459	18.1908	18.7976	19.2975	19.6150	19.6984	19.6923	19.5173	18.8969	18.0940	17.4210	(90)
Living area fraction									fLA = Living area / (4) =			0.3889	(91)
MIT	18.0674	18.3375	18.7462	19.3055	19.7772	20.0896	20.1846	20.1745	19.9866	19.3937	18.6533	18.0373	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0674	18.3375	18.7462	19.3055	19.7772	20.0896	20.1846	20.1745	19.9866	19.3937	18.6533	18.0373	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9757	0.9624	0.9401	0.8893	0.7964	0.6359	0.4652	0.5080	0.7337	0.9027	0.9611	0.9787	(94)
Useful gains	585.3954	656.3400	692.4196	709.1828	658.9599	516.1231	362.6290	376.0939	514.3534	575.1393	568.0308	563.5528	(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	1495.1703	1455.4276	1322.9013	1110.1080	859.6928	577.8710	377.3433	396.5148	622.3159	935.9568	1235.5283	1487.1277	(97)
Space heating kWh	676.8725	536.9869	469.0784	288.6661	149.3453	0.0000	0.0000	0.0000	0.0000	268.4482	480.5982	687.1398	(98a)
Space heating requirement - total per year (kWh/year)												3557.1354	
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	676.8725	536.9869	469.0784	288.6661	149.3453	0.0000	0.0000	0.0000	0.0000	268.4482	480.5982	687.1398	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3557.1354	
Space heating per m2											(98c) / (4) =	49.4047	(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	676.8725	536.9869	469.0784	288.6661	149.3453	0.0000	0.0000	0.0000	0.0000	268.4482	480.5982	687.1398	(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)	733.3396	581.7843	508.2107	312.7477	161.8043	0.0000	0.0000	0.0000	0.0000	290.8431	520.6915	744.4634	(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	220.4616	194.9465	207.2888	182.9599	177.7732	160.6641	159.0263	165.1522	166.7298	185.3210	196.2791	218.1715	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.4058	86.2103	85.8332	85.0777	83.6716	79.8000	79.8000	79.8000	79.8000	84.8899	85.9878	86.4503	(217)
Fuel for water heating, kWh/month	255.1467	226.1289	241.5019	215.0504	212.4653	201.3335	199.2810	206.9577	208.9346	218.3074	228.2638	252.3663	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.2306	17.8342	16.0577	11.7646	9.0873	7.4244	8.2897	10.7753	13.9961	18.3636	20.7417	22.8485	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.4748	-35.6060	-52.7941	-61.2938	-67.7684	-63.8665	-63.0909	-58.7425	-51.3386	-41.5854	-27.2987	-21.0338	(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	-10.6659	-22.7391	-45.7593	-69.5549	-92.7759	-93.5095	-92.4024	-77.8603	-56.5795	-32.7828	-14.3258	-8.4113	(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	3853.8845	(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	2665.7376	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	179.4138	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1186.2601	(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	5598.7758	(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	3853.8845	0.2100	809.3157	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2665.7376	0.2100	559.8049	(264)
Space and water heating			1369.1206	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	179.4138	0.1443	25.8950	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.8934	0.1339	-76.1900	
PV Unit electricity exported	-617.3667	0.1255	-77.5087	
Total			-153.6988	(269)
Total CO2, kg/year			1253.2461	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.4100	(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	3853.8845	1.1300	4354.8895	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2665.7376	1.1300	3012.2834	(278)
Space and water heating			7367.1729	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	179.4138	1.5338	275.1909	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.8934	1.4949	-850.4577	
PV Unit electricity exported	-617.3667	0.4608	-284.5002	
Total			-1134.9579	(283)
Total Primary energy kWh/year			6637.5068	(286)
Target Primary Energy Rate (TPER)			92.1900	(287)

Summary for Input Data

elmhurst energy

Property Reference	1-T-S Gas	**Issued on Date**	05/02/2024
Assessment Reference	1-T-S Gas	**Prop Type Ref**	1-T-S Gas
Property			

SAP Rating	83 B	**DER**	15.71	**TER**	17.70
Environmental	87 B	**% DER < TER**			11.24
CO_2 Emissions (t/year)	1.04	**DFEE**	52.33	**TFEE**	58.33
Compliance Check	See BREL	**% DFEE < TFEE**			10.28
% DPER < TPER	4.40	**DPER**	89.62	**TPER**	93.75

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Top-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	25.00 m	72.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	28.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	24.00	22.50	0.00	None	1.50	Enter Gross Area
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	24.00	20.70	0.00	None	3.30	Enter Gross Area
East	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	28.00	21.67	0.00	None	6.33	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	28.00	25.80	2.50	Stairwell Stairwell 2	2.20	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	93.00

10.0 External Roofs

Summary for Input Data

elmhurst energy

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	73.00	73.00	None	0.00	Enter Gross Area	0.00

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Concrete floor slab, carpeted	100.00	73.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
South	Window	South	South	1.50	0
East	Window	East	East	6.33	0
North	Window	North	North	3.30	0
Opening	Door	Wall to Common	North	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	8.50	0.05	0.05	No
E3 Sill	Independently assessed	7.30	0.05	0.05	No
E4 Jamb	Independently assessed	16.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	6.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	50.00	0.07	0.07	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	6.00	0.02	0.02	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Independently assessed	8.00	0.00	0.00	No
E15 Flat roof with parapet	Independently assessed	34.00	0.56	0.56	No

Y-value	0.15	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues	
21.0 Fixed Cooling System	No

Summary for Input Data

elmhurst energy

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	Manufacturer	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	102	
In Winter	88.80	
In Summer	79.80	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2106	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	

25.0 Main Heating 2	None

26.0 Heat Networks	None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From header tank
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

Summary for Input Data

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	1-T-S Gas	**Issued on Date**	05/02/2024
Assessment Reference	1-T-S Gas	**Prop Type Ref**	1-T-S Gas
Property			

SAP Rating	83 B	**DER**	15.71	**TER**	17.70
Environmental	87 B	**% DER < TER**			11.24
CO_2 Emissions (t/year)	1.04	**DFEE**	52.33	**TFEE**	58.33
Compliance Check	See BREL	**% DFEE < TFEE**			10.28
% DPER < TPER	4.40	**DPER**	89.62	**TPER**	93.75

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	72.0000	(1b)	x 3.0000	(2b) =	216.0000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		216.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		1.5000	(17)
Infiltration rate		0.0750	(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) =	0.0694	(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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	86.4000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(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	
Window (Uw = 0.90)			11.1300	0.8687	9.6689			(27)
Door			2.2000	1.1000	2.4200			(26)
South	24.0000	1.5000	22.5000	0.1400	3.1500	110.0000	2475.0000	(29a)
North	24.0000	3.3000	20.7000	0.1400	2.8980	110.0000	2277.0000	(29a)
East	28.0000	6.3300	21.6700	0.1400	3.0338	110.0000	2383.7000	(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1100	2.8380	14.0000	361.2000	(29a)
External Roof 1	73.0000		73.0000	0.1100	8.0300	9.0000	657.0000	(30)
Total net area of external elements Aum(A, m2)			177.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.0387			(33)
Party Floor 1			73.0000			80.0000	5840.0000	(32d)
Internal Wall 1			93.0000			9.0000	837.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 14830.9000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	205.9847	(35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E3 Sill	7.3000	0.0500	0.3650	
E4 Jamb	16.0000	0.0500	0.8000	
E20 Exposed floor (normal)	6.0000	0.3200	1.9200	
E7 Party floor between dwellings (in blocks of flats)	50.0000	0.0700	3.5000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0000	0.0000	0.0000	
E15 Flat roof with parapet	34.0000	0.5600	19.0400	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			26.1700	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	58.2087	(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	11.1520	11.0284	10.9047	10.2866	10.1630	9.5448	9.5448	9.4212	9.7921	10.1630	10.4102	10.6575	(38)
Heat transfer coeff	69.3607	69.2371	69.1134	68.4953	68.3717	67.7536	67.7536	67.6299	68.0008	68.3717	68.6189	68.8662	(39)
Average = Sum(39)m / 12 =												68.4644	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9633	0.9616	0.9599	0.9513	0.9496	0.9410	0.9410	0.9393	0.9445	0.9496	0.9530	0.9565	(40)
HLP (average)												0.9509	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2937	(42)
Hot water usage for mixer showers	68.7304	67.6781	66.1274	63.7418	61.6044	58.6142	56.2491	59.0140	60.4047	63.3663	66.4507	68.6684	(42a)
Hot water usage for baths	26.4729	26.0733	25.5047	24.6534	23.8861	22.8298	22.0285	23.0084	23.5227	24.5692	25.6574	26.4519	(42b)
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
Average daily hot water use (litres/day)												122.5649	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.3229	130.4848	126.9794	122.3563	118.0655	112.6328	109.4664	114.5974	117.8884	123.2829	128.8415	133.2399	(44)
Energy conte	196.2743	172.6578	181.4510	159.8279	152.1393	130.2561	120.9636	134.8832	136.7447	158.8624	174.1336	195.6726	(45)
Energy content (annual)										Total = Sum(45)m =		1913.8664	
Distribution loss (46)m = 0.15 x (45)m	29.4411	25.8987	27.2176	23.9742	22.8209	19.5384	18.1445	20.2325	20.5117	23.8294	26.1200	29.3509	(46)
Water storage loss:													
Store volume												150.0000	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(64)
										Total per year (kWh/year) = Sum(64)m =		2542.5424	(64)
12Total per year (kWh/year)												2543	(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	107.9767	95.9905	103.0480	94.4804	93.3018	84.6477	82.9359	87.5642	86.8052	95.5373	99.2370	107.7766	(65)

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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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.0875	121.8826	110.0875	113.7571	110.0875	113.7571	110.0875	110.0875	113.7571	110.0875	113.7571	110.0875	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)	145.1300	142.8430	138.5053	131.2227	125.4057	117.5663	111.4730	117.6938	120.5628	128.4103	137.8292	144.8611	(72)
Total internal gains	517.5419	529.1453	507.7325	492.8788	469.2029	448.6972	430.0251	434.1506	445.9693	464.3878	491.6656	508.3638	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.3000	10.6334	0.4000	0.7000	0.7700	6.8089	(74)
East	6.3300	19.6403	0.4000	0.7000	0.7700	24.1236	(76)
South	1.5000	46.7521	0.4000	0.7000	0.7700	13.6077	(78)

Solar gains	44.5402	82.4889	128.2157	180.9457	220.1860	225.5911	214.6339	184.7557	146.6269	95.5226	54.6087	37.2726	(83)

Total gains	562.0821	611.6342	635.9482	673.8245	689.3889	674.2883	644.6590	618.9064	592.5962	559.9105	546.2742	545.6364	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.3952	59.5013	59.6077	60.1456	60.2544	60.8041	60.8041	60.9153	60.5830	60.2544	60.0373	59.8217	
alpha	4.9597	4.9668	4.9738	5.0097	5.0170	5.0536	5.0536	5.0610	5.0389	5.0170	5.0025	4.9881	
util living area													
	0.9855	0.9764	0.9593	0.9069	0.7984	0.6166	0.4573	0.4948	0.7245	0.9160	0.9727	0.9874	(86)
MIT	19.9117	20.0678	20.2934	20.6069	20.8456	20.9677	20.9941	20.9912	20.9279	20.6420	20.2376	19.8852	(87)
Th 2	20.1140	20.1154	20.1169	20.1241	20.1255	20.1328	20.1328	20.1342	20.1299	20.1255	20.1226	20.1198	(88)
util rest of house													
	0.9820	0.9707	0.9489	0.8834	0.7512	0.5429	0.3697	0.4055	0.6546	0.8900	0.9650	0.9843	(89)
MIT 2	19.1328	19.2872	19.5084	19.8108	20.0204	20.1168	20.1309	20.1313	20.0898	19.8492	19.4613	19.1112	(90)
Living area fraction										fLA = Living area / (4) =		0.3889	(91)
MIT	19.4357	19.5908	19.8137	20.1204	20.3413	20.4477	20.4666	20.4657	20.4158	20.1575	19.7632	19.4122	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.2857	19.4408	19.6637	19.9704	20.1913	20.2977	20.3166	20.3157	20.2658	20.0075	19.6132	19.2622	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9777	0.9652	0.9425	0.8787	0.7550	0.5574	0.3885	0.4245	0.6662	0.8859	0.9594	0.9803	(94)
Useful gains	549.5240	590.3472	599.4005	592.0848	520.4930	375.8399	250.4816	262.7450	394.7949	496.0158	524.1163	534.9115	(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													
	1039.4175	1006.7611	909.7883	758.2689	580.5653	386.0400	251.8129	264.8205	419.2765	643.2094	858.6439	1037.2740	(97)
Space heating kWh													
	364.4808	279.8301	230.9285	119.6525	44.6938	0.0000	0.0000	0.0000	0.0000	109.5120	240.8599	373.7577	(98a)
Space heating requirement - total per year (kWh/year)												1763.7154	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	364.4808	279.8301	230.9285	119.6525	44.6938	0.0000	0.0000	0.0000	0.0000	109.5120	240.8599	373.7577	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1763.7154	
Space heating per m2											(98c) / (4) =	24.4960	(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 %)												88.8000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	364.4808	279.8301	230.9285	119.6525	44.6938	0.0000	0.0000	0.0000	0.0000	109.5120	240.8599	373.7577	(98)
Space heating efficiency (main heating system 1)													
	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)													
	410.4513	315.1240	260.0547	134.7438	50.3309	0.0000	0.0000	0.0000	0.0000	123.3244	271.2386	420.8983	(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													
	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9071	84.5914	84.0221	82.8334	81.2712	79.8000	79.8000	79.8000	79.8000	82.6510	84.2048	84.9678	(217)
Fuel for water heating, kWh/month													
	294.0493	261.1201	279.5044	255.3317	252.8985	227.9800	218.4937	235.9368	236.1111	256.8110	268.1624	293.1309	(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	26.1043	23.5781	26.1043	25.2622	26.1043	25.2622	26.1043	26.1043	25.2622	26.1043	25.2622	26.1043	(231)
Lighting	21.2844	17.0751	15.3743	11.2638	8.7005	7.1084	7.9369	10.3167	13.4004	17.5820	19.8588	21.8759	(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												1986.1660	(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												3079.5299	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)		
mechanical ventilation fans (SFP = 0.8400)	221.3568	(230a)
central heating pump	41.0000	(230c)

main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	307.3568	(231)
Electricity for lighting (calculated in Appendix L)	171.7772	(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	5544.8299	(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	1986.1660	0.2100	417.0949	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3079.5299	0.2100	646.7013	(264)
Space and water heating			1063.7961	(265)
Pumps, fans and electric keep-hot	307.3568	0.1387	42.6342	(267)
Energy for lighting	171.7772	0.1443	24.7928	(268)
Total CO2, kg/year			1131.2231	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.7100	(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	1986.1660	1.1300	2244.3676	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3079.5299	1.1300	3479.8688	(278)
Space and water heating			5724.2364	(279)
Pumps, fans and electric keep-hot	307.3568	1.5128	464.9694	(281)
Energy for lighting	171.7772	1.5338	263.4776	(282)
Total Primary energy kWh/year			6452.6833	(286)
Dwelling Primary energy Rate (DPER)			89.6200	(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	72.0000	(1b)	x 3.0000	(2b) =	216.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		216.0000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (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) =	30.0000 / (5) =	0.1389 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3889 (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) =	0.3597 (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	0.4586	0.4497	0.4407	0.3957	0.3867	0.3417	0.3417	0.3327	0.3597	0.3867	0.4047	0.4227	(22b)
Effective ac	0.6052	0.6011	0.5971	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5893	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			11.1300	1.1450	12.7443			(27)
South	24.0000	1.5000	22.5000	0.1800	4.0500			(29a)
North	24.0000	3.3000	20.7000	0.1800	3.7260			(29a)
East	28.0000	6.3300	21.6700	0.1800	3.9006			(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1800	4.6440			(29a)
External Roof 1	73.0000		73.0000	0.1100	8.0300			(30)
Total net area of external elements Aum(A, m2)			177.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.2949			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 205.9847 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3 Sill	7.3000	0.0500	0.3650
E4 Jamb	16.0000	0.0500	0.8000
E20 Exposed floor (normal)	6.0000	0.3200	1.9200
E7 Party floor between dwellings (in blocks of flats)	50.0000	0.0700	3.5000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0000	0.0000	0.0000
E15 Flat roof with parapet	34.0000	0.5600	19.0400

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 26.1700 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 65.4649 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.1371	42.8460	42.5606	41.2203	40.9695	39.8022	39.8022	39.5860	40.2518	40.9695	41.4768	42.0072	(38)
Heat transfer coeff	108.6020	108.3108	108.0255	106.6852	106.4344	105.2670	105.2670	105.0509	105.7167	106.4344	106.9417	107.4721	(39)

Average = Sum(39)m / 12 = 106.6840

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5084	1.5043	1.5004	1.4817	1.4783	1.4620	1.4620	1.4590	1.4683	1.4783	1.4853	1.4927	(40)
HLP (average)												1.4817	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2937 (42)

Hot water usage for mixer showers												
	62.6772	61.7353	60.3627	57.7366	55.7986	53.6373	52.4088	53.7710	55.2642	57.5847	60.2673	62.4371 (42a)
Hot water usage for baths												
	27.0765	26.6744	26.1081	25.0640	24.2822	23.4152	22.9470	23.5093	24.1216	25.0492	26.1148	26.9849 (42b)
Hot water usage for other uses												
	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196 (42c)

Average daily hot water use (litres/day) 117.5446 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	127.8733	125.1431	121.8181	116.7617	112.6557	108.2413	106.5446	109.8552	113.3469	117.9812	123.1155	127.5416	(44)
Energy conte	202.5201	178.2021	187.2299	159.8409	151.6562	133.0953	128.8565	136.0237	139.7680	160.0994	175.4006	199.6994	(45)

Energy content (annual) Total = Sum(45)m = 1952.3920

Distribution loss (46)m = 0.15 x (45)m												
	30.3780	26.7303	28.0845	23.9761	22.7484	19.9643	19.3285	20.4036	20.9652	24.0149	26.3101	29.9549 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	249.1150	220.2878	233.8248	204.9327	198.2511	178.1872	175.4514	182.6186	184.8599	206.6943	220.4925	246.2943 (62)
WWHRS	-28.6534	-25.3413	-26.5360	-21.9728	-20.4779	-17.5231	-16.4251	-17.4664	-18.1300	-21.3733	-24.2134	-28.1228 (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												
	220.4616	194.9465	207.2888	182.9599	177.7732	160.6641	159.0263	165.1522	166.7298	185.3210	196.2791	218.1715 (64)

Total per year (kWh/year) = Sum(64)m = 2234.7740 (64)

12Total per year (kWh/year) 2235 (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												
	104.6138	92.9208	99.5299	89.2206	87.7016	80.3277	80.1207	82.5038	82.5463	90.5090	94.3942	103.6760 (65)

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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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	106.9910	118.4543	106.9910	110.5574	106.9910	110.5574	106.9910	106.9910	110.5574	106.9910	110.5574	106.9910	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)													
	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)													
	140.6100	138.2750	133.7767	123.9175	117.8785	111.5662	107.6891	110.8922	114.6477	121.6518	131.1030	139.3494	(72)
Total internal gains													
	509.9255	521.1490	499.9074	482.3739	458.5793	439.4975	423.1448	424.2526	436.8545	454.5329	481.7397	499.7557	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.3000	10.6334	0.6300	0.7000	0.7700	10.7240	(74)
East	6.3300	19.6403	0.6300	0.7000	0.7700	37.9947	(76)
South	1.5000	46.7521	0.6300	0.7000	0.7700	21.4321	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	70.1508	129.9200	201.9398	284.9894	346.7929	355.3059	338.0483	290.9903	230.9374	150.4481	86.0087	58.7043	(83)
Total gains	580.0762	651.0690	701.8471	767.3633	805.3722	794.8034	761.1931	715.2429	667.7919	604.9810	567.7484	558.4600	(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	37.9339	38.0358	38.1363	38.6154	38.7064	39.1357	39.1357	39.2162	38.9692	38.7064	38.5228	38.3327	
alpha	3.5289	3.5357	3.5424	3.5744	3.5804	3.6090	3.6090	3.6144	3.5979	3.5804	3.5682	3.5555	
util living area	0.9878	0.9805	0.9670	0.9304	0.8543	0.7143	0.5644	0.6121	0.8157	0.9444	0.9798	0.9893	(86)
MIT	19.0054	19.2215	19.5707	20.0675	20.5119	20.8280	20.9455	20.9262	20.7006	20.1338	19.4977	18.9793	(87)
Th 2	19.6812	19.6843	19.6872	19.7012	19.7038	19.7161	19.7161	19.7184	19.7114	19.7038	19.6985	19.6930	(88)
util rest of house	0.9842	0.9749	0.9569	0.9075	0.8031	0.6133	0.4189	0.4681	0.7340	0.9214	0.9730	0.9862	(89)
MIT 2	17.4130	17.6888	18.1315	18.7557	19.2782	19.6097	19.6971	19.6896	19.4971	18.8498	18.0512	17.3872	(90)
Living area fraction									fLA = Living area / (4) =			0.3889	(91)
MIT	18.0323	18.2848	18.6912	19.2658	19.7580	20.0835	20.1826	20.1705	19.9651	19.3491	18.6138	18.0063	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0323	18.2848	18.6912	19.2658	19.7580	20.0835	20.1826	20.1705	19.9651	19.3491	18.6138	18.0063	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9779	0.9666	0.9467	0.8979	0.8056	0.6450	0.4748	0.5226	0.7526	0.9132	0.9649	0.9805	(94)
Useful gains	567.2401	629.3350	664.4346	689.0190	648.7801	512.6211	361.4224	373.7570	502.5824	552.4485	547.8488	547.5426	(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	1491.3534	1449.7201	1316.9602	1105.8810	857.6446	577.2274	377.1266	396.0965	620.0429	931.2067	1231.3014	1483.7937	(97)
Space heating kWh	687.5403	551.2988	485.4790	300.1406	155.3952	0.0000	0.0000	0.0000	0.0000	281.7961	492.0859	696.5708	(98a)
Space heating requirement - total per year (kWh/year)												3650.3067	
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	687.5403	551.2988	485.4790	300.1406	155.3952	0.0000	0.0000	0.0000	0.0000	281.7961	492.0859	696.5708	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3650.3067	
Space heating per m2											(98c) / (4) =	50.6987	(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	687.5403	551.2988	485.4790	300.1406	155.3952	0.0000	0.0000	0.0000	0.0000	281.7961	492.0859	696.5708	(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)	744.8974	597.2901	525.9794	325.1794	168.3588	0.0000	0.0000	0.0000	0.0000	305.3046	533.1375	754.6813	(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	220.4616	194.9465	207.2888	182.9599	177.7732	160.6641	159.0263	165.1522	166.7298	185.3210	196.2791	218.1715	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.4332	86.2586	85.9011	85.1625	83.7595	79.8000	79.8000	79.8000	79.8000	84.9969	86.0333	86.4739	(217)
Fuel for water heating, kWh/month	255.0659	226.0024	241.3109	214.8363	212.2425	201.3335	199.2810	206.9577	208.9346	218.0327	228.1432	252.2974	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.2306	17.8342	16.0577	11.7646	9.0873	7.4244	8.2897	10.7753	13.9961	18.3636	20.7417	22.8485	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.4748	-35.6060	-52.7941	-61.2938	-67.7684	-63.8665	-63.0909	-58.7425	-51.3386	-41.5854	-27.2987	-21.0338	(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	-10.6659	-22.7391	-45.7593	-69.5549	-92.7759	-93.5095	-92.4024	-77.8603	-56.5795	-32.7828	-14.3258	-8.4113	(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	3954.8285	(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	2664.4382	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	179.4138	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1186.2601	(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	5698.4203	(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	3954.8285	0.2100	830.5140	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2664.4382	0.2100	559.5320	(264)
Space and water heating			1390.0460	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	179.4138	0.1443	25.8950	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.8934	0.1339	-76.1900	
PV Unit electricity exported	-617.3667	0.1255	-77.5087	
Total			-153.6988	(269)
Total CO2, kg/year			1274.1714	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.7000	(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	3954.8285	1.1300	4468.9562	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2664.4382	1.1300	3010.8151	(278)
Space and water heating			7479.7713	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	179.4138	1.5338	275.1909	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.8934	1.4949	-850.4577	
PV Unit electricity exported	-617.3667	0.4608	-284.5002	
Total			-1134.9579	(283)
Total Primary energy kWh/year			6750.1051	(286)
Target Primary Energy Rate (TPER)			93.7500	(287)

Summary for Input Data

elmhurst energy

Property Reference	2-G-N Gas	**Issued on Date**	05/02/2024
Assessment Reference	2-G-N	**Prop Type Ref**	2-G-N Gas
Property			

SAP Rating	84 B	**DER**	13.36	**TER**	15.73
Environmental	89 B	**% DER < TER**			15.07
CO_2 Emissions (t/year)	0.96	**DFEE**	43.78	**TFEE**	51.01
Compliance Check	See BREL	**% DFEE < TFEE**			14.18
% DPER < TPER	7.58	**DPER**	76.83	**TPER**	83.13

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	28.00 m	78.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	28.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	29.00	22.80	0.00	None	6.20	Enter Gross Area
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	29.00	25.86	0.00	None	3.14	Enter Gross Area
East	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	28.00	22.50	0.00	None	5.50	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	28.00	28.00	2.50	Stairwell Stairwell 2	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	90.00

10.0 External Roofs

Summary for Input Data

elmhurst energy

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	6.00	6.00	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling	Concrete floor slab, carpeted	100.00	78.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Exposed Floor - Solid	Lowest occupied	Other	0.11	None	0.00	0.00	78.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
North	Window	North	North	6.20	0
East	Window	East	East	3.30	0
South	Window	South	South	3.14	0
Door	Door	East	East	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	10.00	0.05	0.05	No
E3 Sill	Independently assessed	8.00	0.05	0.05	No
E4 Jamb	Independently assessed	20.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	28.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	25.00	0.07	0.07	No
P7 Party Wall - Exposed floor (normal)	Independently assessed	9.30	0.16	0.16	No
E16 Corner (normal)	Independently assessed	9.00	0.09	0.09	No
E18 Party wall between dwellings	Independently assessed	6.00	0.06	0.06	No

Y-value	0.08	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
19.0 Mechanical Ventilation		
Mechanical Ventilation		
Mechanical Ventilation System Present	Yes	
Approved Installation	No	
Mechanical Ventilation data Type	Database	
Type	Balanced mechanical ventilation with heat recovery	
MV Reference Number	500480	
Configuration	1	
Manufacturer SFP	0.60	
Duct Type	Rigid	
MVHR Efficiency	96.00	
Wet Rooms	1	
SFP from Installer Commissioning Certificate	No	
MVHR System Location	Inside heated envelope (installed exclusively)	
Duct Installation Specification	Level 1	
20.0 Fans, Open Fireplaces, Flues		

Summary for Input Data

elmhurst energy

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	Manufacturer	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	102	
In Winter	88.80	
In Summer	79.80	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2106	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From header tank
Bath Count	1
Supplementary Immersion	No

Summary for Input Data

elmhurst energy

Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	2-G-N Gas	**Issued on Date**	05/02/2024
Assessment Reference	2-G-N	**Prop Type Ref**	2-G-N Gas
Property			

SAP Rating	84 B	**DER**	13.36	**TER**	15.73
Environmental	89 B	**% DER < TER**			15.07
CO_2 Emissions (t/year)	0.96	**DFEE**	43.78	**TFEE**	51.01
Compliance Check	See BREL	**% DFEE < TFEE**			14.18
% DPER < TPER	7.58	**DPER**	76.83	**TPER**	83.13

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	78.0000 (1b)	x	3.0000 (2b)	=	234.0000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.0000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	234.0000	(5)

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2. Ventilation rate

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	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	0 * 10 =	0.0000 (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) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		1.5000 (17)
Infiltration rate		0.0750 (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) =	0.0694 (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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	86.4000 (23c)

Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			12.6400	0.8687	10.9807			(27)
Door			2.2000	1.1000	2.4200			(26)
Heatloss Floor 1			78.0000	0.1100	8.5800			(28b)
North	29.0000	6.2000	22.8000	0.1400	3.1920	110.0000	2508.0000	(29a)
South	29.0000	3.1400	25.8600	0.1400	3.6204	110.0000	2844.6000	(29a)
East	28.0000	5.5000	22.5000	0.1400	3.1500	110.0000	2475.0000	(29a)
Wall to Common	28.0000		28.0000	0.1100	3.0800	14.0000	392.0000	(29a)
External Roof 1	6.0000		6.0000	0.1100	0.6600	9.0000	54.0000	(30)
Total net area of external elements Aum(A, m2)			198.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.6831			(33)
Party Ceiling			78.0000			100.0000	7800.0000	(32b)
Internal Wall 1			90.0000			9.0000	810.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 16883.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	216.4564 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.0000	0.0500	0.5000
E3 Sill	8.0000	0.0500	0.4000
E4 Jamb	20.0000	0.0500	1.0000
E20 Exposed floor (normal)	28.0000	0.3200	8.9600
E7 Party floor between dwellings (in blocks of flats)	25.0000	0.0700	1.7500
P7 Party Wall - Exposed floor (normal)	9.3000	0.1600	1.4880
E16 Corner (normal)	9.0000	0.0900	0.8100
E18 Party wall between dwellings	6.0000	0.0600	0.3600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.2680 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.9511 (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	12.0813	11.9474	11.8135	11.1438	11.0099	10.3402	10.3402	10.2063	10.6081	11.0099	11.2777	11.5456	(38)
Heat transfer coeff	63.0324	62.8985	62.7645	62.0949	61.9610	61.2913	61.2913	61.1574	61.5592	61.9610	62.2288	62.4967	(39)
Average = Sum(39)m / 12 =												62.0614	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8081	0.8064	0.8047	0.7961	0.7944	0.7858	0.7858	0.7841	0.7892	0.7944	0.7978	0.8012	(40)
HLP (average)												0.7957	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4238 (42)

Hot water usage for mixer showers

71.1230	70.0342	68.4294	65.9608	63.7490	60.6547	58.2073	61.0684	62.5075	65.5723	68.7640	71.0589	(42a)

Hot water usage for baths

27.3903	26.9768	26.3886	25.5077	24.7138	23.6210	22.7919	23.8057	24.3378	25.4207	26.5465	27.3685	(42b)

Hot water usage for other uses

39.4523	38.0177	36.5831	35.1484	33.7138	32.2792	32.2792	33.7138	35.1484	36.5831	38.0177	39.4523	(42c)

Average daily hot water use (litres/day) 126.8329 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.9656	135.0286	131.4011	126.6169	122.1766	116.5548	113.2783	118.5879	121.9937	127.5760	133.3281	137.8798	(44)
Energy conte	203.1092	178.6702	187.7694	165.3934	157.4369	134.7918	125.1759	139.5802	141.5066	164.3945	180.1974	202.4865	(45)
Energy content (annual)										Total = Sum(45)m =		1980.5120	

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

30.4664	26.8005	28.1654	24.8090	23.6155	20.2188	18.7764	20.9370	21.2260	24.6592	27.0296	30.3730	(46)

Water storage loss:
Store volume 150.0000 (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

256.5036	226.8974	241.1638	217.0654	210.8313	186.4638	178.5703	192.9746	193.1786	217.7889	231.8694	255.8809	(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

256.5036	226.8974	241.1638	217.0654	210.8313	186.4638	178.5703	192.9746	193.1786	217.7889	231.8694	255.8809	(64)
									Total per year (kWh/year) = Sum(64)m =		2609.1880	(64)
12Total per year (kWh/year)											2609	(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

110.2493	97.9896	105.1489	96.3309	95.0633	86.1559	84.3365	89.1259	88.3885	97.3767	101.2532	110.0423	(65)

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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	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.1312	128.5739	116.1312	120.0023	116.1312	120.0023	116.1312	116.1312	120.0023	116.1312	120.0023	116.1312	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.2098	217.4430	211.8154	199.8349	184.7117	170.4980	161.0024	158.7692	164.3968	176.3773	191.5005	205.7142	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	(71)
Water heating gains (Table 5)	148.1846	145.8178	141.3291	133.7929	127.7733	119.6609	113.3555	119.7929	122.7619	130.8827	140.6295	147.9063	(72)
Total internal gains	541.8829	554.1920	531.6330	515.9874	490.9734	469.5184	449.8464	454.0506	466.5182	485.7484	514.4895	532.1090	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.2000	10.6334	0.4000	0.7000	0.7700	12.7925	(74)
East	3.3000	19.6403	0.4000	0.7000	0.7700	12.5763	(76)
South	3.1400	46.7521	0.4000	0.7000	0.7700	28.4854	(78)

Solar gains	53.8541	95.7007	141.4833	192.9806	232.2928	237.7130	226.2259	195.8109	159.1454	108.6115	65.2272	45.6205	(83)
Total gains	595.7370	649.8927	673.1164	708.9679	723.2662	707.2314	676.0722	649.8615	625.6636	594.3599	579.7167	577.7295	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.4044	74.5628	74.7219	75.5278	75.6910	76.5180	76.5180	76.6855	76.1850	75.6910	75.3652	75.0422	
alpha	5.9603	5.9709	5.9815	6.0352	6.0461	6.1012	6.1012	6.1124	6.0790	6.0461	6.0243	6.0028	
util living area	0.9851	0.9734	0.9512	0.8815	0.7454	0.5478	0.3980	0.4314	0.6568	0.8903	0.9685	0.9873	(86)
MIT	20.2303	20.3718	20.5538	20.7906	20.9384	20.9919	20.9990	20.9984	20.9770	20.8090	20.4973	20.2064	(87)
Th 2	20.2463	20.2478	20.2493	20.2567	20.2582	20.2657	20.2657	20.2672	20.2627	20.2582	20.2552	20.2523	(88)
util rest of house	0.9815	0.9671	0.9396	0.8556	0.6994	0.4877	0.3321	0.3635	0.5946	0.8610	0.9600	0.9842	(89)
MIT 2	19.5516	19.6910	19.8680	20.0933	20.2178	20.2618	20.2654	20.2666	20.2505	20.1145	19.8211	19.5330	(90)
Living area fraction										fLA = Living area / (4) =		0.3590	(91)
MIT	19.7952	19.9354	20.1142	20.3436	20.4765	20.5239	20.5287	20.5293	20.5113	20.3638	20.0638	19.7747	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6452	19.7854	19.9642	20.1936	20.3265	20.3739	20.3787	20.3793	20.3613	20.2138	19.9138	19.6247	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9779	0.9625	0.9344	0.8531	0.7039	0.4967	0.3422	0.3739	0.6032	0.8590	0.9552	0.9809	(94)
Useful gains	582.5515	625.5067	628.9743	604.8458	509.0761	351.2836	231.3823	242.9890	377.3939	510.5719	553.7649	566.7136	(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	967.2458	936.2673	845.0747	701.2759	534.5046	353.8903	231.6032	243.3654	385.4406	595.6816	797.3893	963.9945	(97)
Space heating kWh	286.2125	208.8311	160.7787	69.4297	18.9188	0.0000	0.0000	0.0000	0.0000	63.3217	175.4096	295.5770	(98a)
Space heating requirement - total per year (kWh/year)												1278.4791	
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	286.2125	208.8311	160.7787	69.4297	18.9188	0.0000	0.0000	0.0000	0.0000	63.3217	175.4096	295.5770	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1278.4791	
Space heating per m2										(98c) / (4) =		16.3908	(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 %)												88.8000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	286.2125	208.8311	160.7787	69.4297	18.9188	0.0000	0.0000	0.0000	0.0000	63.3217	175.4096	295.5770	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	322.3114	235.1702	181.0570	78.1866	21.3050	0.0000	0.0000	0.0000	0.0000	71.3082	197.5333	332.8570	(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	256.5036	226.8974	241.1638	217.0654	210.8313	186.4638	178.5703	192.9746	193.1786	217.7889	231.8694	255.8809	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.3061	83.8741	83.1719	81.8094	80.4716	79.8000	79.8000	79.8000	79.8000	81.6644	83.4423	84.3840	(217)
Fuel for water heating, kWh/month	304.2526	270.5212	289.9584	265.3307	261.9947	233.6639	223.7723	241.8228	242.0785	266.6878	277.8799	303.2338	(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	27.6710	24.9931	27.6710	26.7783	27.6710	26.7783	27.6710	27.6710	26.7783	27.6710	26.7783	27.6710	(231)
Lighting	22.4529	18.0125	16.2183	11.8822	9.1782	7.4986	8.3726	10.8831	14.1360	18.5472	20.9491	23.0769	(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												1439.7287	(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												3181.1964	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)

mechanical ventilation fans (SFP = 0.8400) 239.8032 (230a)

central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	325.8032	(231)
Electricity for lighting (calculated in Appendix L)	181.2077	(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	5127.9361	(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	1439.7287	0.2100	302.3430	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3181.1964	0.2100	668.0513	(264)
Space and water heating			970.3943	(265)
Pumps, fans and electric keep-hot	325.8032	0.1387	45.1929	(267)
Energy for lighting	181.2077	0.1443	26.1539	(268)
Total CO2, kg/year			1041.7411	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.3600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1439.7287	1.1300	1626.8934	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3181.1964	1.1300	3594.7520	(278)
Space and water heating			5221.6454	(279)
Pumps, fans and electric keep-hot	325.8032	1.5128	492.8751	(281)
Energy for lighting	181.2077	1.5338	277.9425	(282)
Total Primary energy kWh/year			5992.4629	(286)
Dwelling Primary energy Rate (DPER)			76.8300	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		78.0000 (1b)	x	3.0000 (2b)	=	234.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	234.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.1282	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3782	(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) =	0.3498	(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	0.4460	0.4373	0.4286	0.3848	0.3761	0.3323	0.3323	0.3236	0.3498	0.3761	0.3936	0.4111	(22b)
Effective ac	0.5995	0.5956	0.5918	0.5740	0.5707	0.5552	0.5552	0.5524	0.5612	0.5707	0.5774	0.5845	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			12.6400	1.1450	14.4733			(27)
Heatloss Floor 1			78.0000	0.1300	10.1400			(28b)
North	29.0000	6.2000	22.8000	0.1800	4.1040			(29a)
South	29.0000	3.1400	25.8600	0.1800	4.6548			(29a)
East	28.0000	5.5000	22.5000	0.1800	4.0500			(29a)
Wall to Common	28.0000		28.0000	0.1800	5.0400			(29a)
External Roof 1	6.0000		6.0000	0.1100	0.6600			(30)
Total net area of external elements Aum(A, m2)			198.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.3221			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 196.4564 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.0000	0.0500	0.5000
E3 Sill	8.0000	0.0500	0.4000
E4 Jamb	20.0000	0.0500	1.0000
E20 Exposed floor (normal)	28.0000	0.3200	8.9600
E7 Party floor between dwellings (in blocks of flats)	25.0000	0.0700	1.7500
P7 Party Wall - Exposed floor (normal)	9.3000	0.1600	1.4880
E16 Corner (normal)	9.0000	0.0900	0.8100
E18 Party wall between dwellings	6.0000	0.0600	0.3600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.2680 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 60.5901 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2917	45.9934	45.7010	44.3277	44.0708	42.8747	42.8747	42.6532	43.3354	44.0708	44.5906	45.1340	(38)
Heat transfer coeff	106.8818	106.5835	106.2911	104.9178	104.6609	103.4648	103.4648	103.2432	103.9255	104.6609	105.1807	105.7241	(39)
Average = Sum(39)m / 12 =												104.9166	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3703	1.3665	1.3627	1.3451	1.3418	1.3265	1.3265	1.3236	1.3324	1.3418	1.3485	1.3554	(40)
HLP (average)												1.3451	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4238 (42)

Hot water usage for mixer showers

64.8591	63.8844	62.4641	59.7465	57.7410	55.5045	54.2333	55.6429	57.1881	59.5894	62.3653	64.6106	(42a)

Hot water usage for baths

28.0148	27.5987	27.0128	25.9325	25.1236	24.2267	23.7422	24.3240	24.9575	25.9172	27.0198	27.9201	(42b)

Hot water usage for other uses

39.4523	38.0177	36.5831	35.1484	33.7138	32.2792	32.2792	33.7138	35.1484	36.5831	38.0177	39.4523	(42c)

Average daily hot water use (litres/day) 121.6378 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.3262	129.5008	126.0600	120.8275	116.5785	112.0104	110.2546	113.6807	117.2939	122.0897	127.4028	131.9830	(44)
Energy conte	209.5724	184.4075	193.7495	165.4068	156.9370	137.7298	133.3434	140.7604	144.6352	165.6745	181.5086	206.6535	(45)
Energy content (annual)										Total = Sum(45)m =		2020.3786	
Distribution loss (46)m = 0.15 x (45)m	31.4359	27.6611	29.0624	24.8110	23.5406	20.6595	20.0015	21.1141	21.6953	24.8512	27.2263	30.9980	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	256.1673	226.4932	240.3444	210.4986	203.5319	182.8217	179.9383	187.3553	189.7270	212.2694	226.6004	253.2484	(62)
WWHRS	-29.6509	-26.2235	-27.4597	-22.7377	-21.1908	-18.1331	-16.9969	-18.0745	-18.7612	-22.1174	-25.0563	-29.1018	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	226.5164	200.2697	212.8846	187.7609	182.3412	164.6886	162.9415	169.2808	170.9658	190.1521	201.5441	224.1466	(64)
										Total per year (kWh/year) = Sum(64)m =		2293.4923	(64)
12Total per year (kWh/year)												2293	(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	106.9587	94.9841	101.6976	91.0712	89.4575	81.8686	81.6126	84.0788	84.1647	92.3627	96.4251	105.9882	(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	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.9645	125.0678	112.9645	116.7300	112.9645	116.7300	112.9645	112.9645	116.7300	112.9645	116.7300	112.9645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.2098	217.4430	211.8154	199.8349	184.7117	170.4980	161.0024	158.7692	164.3968	176.3773	191.5005	205.7142	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	(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)	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	(71)
Water heating gains (Table 5)	143.7618	141.3453	136.6904	126.4878	120.2385	113.7064	109.6944	113.0091	116.8954	124.1434	133.9237	142.4573	(72)
Total internal gains	534.2933	546.2134	523.8275	505.4100	480.2720	460.2917	443.0185	444.1000	457.3794	475.8424	504.5115	523.4932	(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	6.2000	10.6334	0.6300	0.7000	0.7700	20.1482	(74)
East	3.3000	19.6403	0.6300	0.7000	0.7700	19.8077	(76)
South	3.1400	46.7521	0.6300	0.7000	0.7700	44.8644	(78)

Solar gains	84.8203	150.7285	222.8363	303.9444	365.8611	374.3980	356.3058	308.4022	250.6541	171.0631	102.7328	71.8524	(83)
Total gains	619.1136	696.9420	746.6638	809.3544	846.1331	834.6896	799.3243	752.5022	708.0334	646.9055	607.2443	595.3456	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.8249	39.9363	40.0462	40.5704	40.6700	41.1402	41.1402	41.2284	40.9578	40.6700	40.4690	40.2610	
alpha	3.6550	3.6624	3.6697	3.7047	3.7113	3.7427	3.7427	3.7486	3.7305	3.7113	3.6979	3.6841	
util living area	0.9863	0.9778	0.9627	0.9223	0.8391	0.6899	0.5375	0.5844	0.7936	0.9356	0.9769	0.9881	(86)
MIT	19.1467	19.3660	19.7000	20.1701	20.5819	20.8625	20.9592	20.9440	20.7531	20.2328	19.6226	19.1194	(87)
Th 2	19.7862	19.7891	19.7920	19.8057	19.8082	19.8202	19.8202	19.8224	19.8156	19.8082	19.8031	19.7977	(88)
util rest of house	0.9826	0.9718	0.9522	0.8990	0.7889	0.5958	0.4075	0.4545	0.7146	0.9116	0.9697	0.9849	(89)
MIT 2	17.6662	17.9456	18.3684	18.9576	19.4393	19.7327	19.8049	19.7992	19.6358	19.0463	18.2828	17.6389	(90)
Living area fraction									fLA = Living area / (4) =			0.3590	(91)
MIT	18.1977	18.4555	18.8464	19.3929	19.8495	20.1382	20.2193	20.2101	20.0369	19.4722	18.7638	18.1703	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1977	18.4555	18.8464	19.3929	19.8495	20.1382	20.2193	20.2101	20.0369	19.4722	18.7638	18.1703	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9758	0.9629	0.9414	0.8892	0.7909	0.6232	0.4535	0.4998	0.7313	0.9030	0.9611	0.9787	(94)
Useful gains	604.1212	671.0949	702.8869	719.7003	669.1941	520.1854	362.4853	376.0735	517.7787	584.1715	583.6102	582.6657	(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	1485.4066	1444.7878	1312.3104	1100.8899	852.9290	573.0128	374.4668	393.3713	616.9944	928.5725	1226.8032	1476.9995	(97)
Space heating kWh	655.6763	519.9216	453.4111	274.4565	136.6987	0.0000	0.0000	0.0000	0.0000	256.2343	463.0990	665.3844	(98a)
Space heating requirement - total per year (kWh/year)												3424.8818	
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	655.6763	519.9216	453.4111	274.4565	136.6987	0.0000	0.0000	0.0000	0.0000	256.2343	463.0990	665.3844	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3424.8818	
Space heating per m2										(98c) / (4) =		43.9087	(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	655.6763	519.9216	453.4111	274.4565	136.6987	0.0000	0.0000	0.0000	0.0000	256.2343	463.0990	665.3844	(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)	710.3752	563.2953	491.2363	297.3526	148.1026	0.0000	0.0000	0.0000	0.0000	277.6103	501.7323	720.8931	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	226.5164	200.2697	212.8846	187.7609	182.3412	164.6886	162.9415	169.2808	170.9658	190.1521	201.5441	224.1466	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3009	86.0997	85.7114	84.9099	83.4227	79.8000	79.8000	79.8000	79.8000	84.7294	85.8635	86.3461	(217)
Fuel for water heating, kWh/month	262.4730	232.6020	248.3737	221.1295	218.5750	206.3767	204.1873	212.1314	214.2429	224.4229	234.7262	259.5908	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	23.4718	18.8299	16.9543	12.4214	9.5947	7.8389	8.7526	11.3769	14.7775	19.3889	21.8997	24.1241	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.4082	-38.3633	-56.7994	-65.8408	-72.7003	-68.4715	-67.6299	-63.0084	-55.1352	-44.7495	-29.4322	-22.7009	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-11.6609	-24.8439	-49.9667	-75.9120	-101.2227	-102.0192	-100.8212	-84.9779	-61.7760	-35.8160	-15.6611	-9.1980	(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	3710.5979 (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	2738.8312 (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)	189.4308 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1285.1151 (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	5439.7447 (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	3710.5979	0.2100	779.2256	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2738.8312	0.2100	575.1546	(264)
Space and water heating			1354.3801	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	189.4308	0.1443	27.3407	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-611.2397	0.1340	-81.8820	
PV Unit electricity exported	-673.8755	0.1256	-84.6115	
Total			-166.4936	(269)
Total CO2, kg/year			1227.1565	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.7300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3710.5979	1.1300	4192.9756	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2738.8312	1.1300	3094.8793	(278)
Space and water heating			7287.8549	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	189.4308	1.5338	290.5553	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-611.2397	1.4951	-913.8402	
PV Unit electricity exported	-673.8755	0.4609	-310.5717	
Total			-1224.4120	(283)
Total Primary energy kWh/year			6484.0990	(286)
Target Primary Energy Rate (TPER)			83.1300	(287)

Summary for Input Data

elmhurst energy

Property Reference	2-G-S Gas	**Issued on Date**	05/02/2024
Assessment Reference	2-G-S Gas	**Prop Type Ref**	2-G-S Gas
Property			

SAP Rating	84 B	**DER**	13.10	**TER**	15.29
Environmental	89 B	**% DER < TER**			14.32
CO_2 Emissions (t/year)	0.95	**DFEE**	42.38	**TFEE**	48.96
Compliance Check	See BREL	**% DFEE < TFEE**			13.45
% DPER < TPER	6.58	**DPER**	75.43	**TPER**	80.75

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	28.00 m	78.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	28.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	29.00	22.80	0.00	None	6.20	Enter Gross Area
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	29.00	25.86	0.00	None	3.14	Enter Gross Area
West	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	28.00	22.50	0.00	None	5.50	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	28.00	28.00	2.50	Stairwell Stairwell 2	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	90.00

10.0 External Roofs

Summary for Input Data

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	6.00	6.00	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling	Concrete floor slab, carpeted	100.00	78.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Exposed Floor - Solid	Lowest occupied	Other	0.11	None	0.00	0.00	78.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
South	Window	South	South	6.20	0
West	Window	West	West	3.30	0
North	Window	North	North	3.14	0
Door	Door	West	East	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	10.00	0.05	0.05	No
E3 Sill	Independently assessed	8.00	0.05	0.05	No
E4 Jamb	Independently assessed	20.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	28.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	25.00	0.07	0.07	No
P7 Party Wall - Exposed floor (normal)	Independently assessed	9.30	0.16	0.16	No
E16 Corner (normal)	Independently assessed	9.00	0.09	0.09	No
E18 Party wall between dwellings	Independently assessed	6.00	0.06	0.06	No

Y-value	0.08	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
19.0 Mechanical Ventilation		
Mechanical Ventilation		
Mechanical Ventilation System Present	Yes	
Approved Installation	No	
Mechanical Ventilation data Type	Database	
Type	Balanced mechanical ventilation with heat recovery	
MV Reference Number	500480	
Configuration	1	
Manufacturer SFP	0.60	
Duct Type	Rigid	
MVHR Efficiency	96.00	
Wet Rooms	1	
SFP from Installer Commissioning Certificate	No	
MVHR System Location	Inside heated envelope (installed exclusively)	
Duct Installation Specification	Level 1	

20.0 Fans, Open Fireplaces, Flues

Summary for Input Data

elmhurst energy

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	Manufacturer	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	102	
In Winter	88.80	
In Summer	79.80	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2106	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From header tank
Bath Count	1
Supplementary Immersion	No

Summary for Input Data

elmhurst energy

Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	2-G-S Gas	**Issued on Date**	05/02/2024
Assessment Reference	2-G-S Gas	**Prop Type Ref**	2-G-S Gas
Property			

SAP Rating	84 B	**DER**	13.10	**TER**	15.29
Environmental	89 B	**% DER < TER**			14.32
CO_2 Emissions (t/year)	0.95	**DFEE**	42.38	**TFEE**	48.96
Compliance Check	See BREL	**% DFEE < TFEE**			13.45
% DPER < TPER	6.58	**DPER**	75.43	**TPER**	80.75

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	78.0000 (1b)	x	3.0000 (2b)	=	234.0000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.0000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	234.0000	(5)

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2. Ventilation rate

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	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	0 * 10 =	0.0000 (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) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		1.5000 (17)
Infiltration rate		0.0750 (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) =	0.0694 (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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	86.4000 (23c)

Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			12.6400	0.8687	10.9807			(27)
Door			2.2000	1.1000	2.4200			(26)
Heatloss Floor 1			78.0000	0.1100	8.5800			(28b)
South	29.0000	6.2000	22.8000	0.1400	3.1920	110.0000	2508.0000	(29a)
North	29.0000	3.1400	25.8600	0.1400	3.6204	110.0000	2844.6000	(29a)
West	28.0000	5.5000	22.5000	0.1400	3.1500	110.0000	2475.0000	(29a)
Wall to Common	28.0000		28.0000	0.1100	3.0800	14.0000	392.0000	(29a)
External Roof 1	6.0000		6.0000	0.1100	0.6600	9.0000	54.0000	(30)
Total net area of external elements Aum(A, m2)			198.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.6831			(33)
Party Ceiling			78.0000			100.0000	7800.0000	(32b)
Internal Wall 1			90.0000			9.0000	810.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16883.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		216.4564 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	10.0000	0.0500	0.5000	
E3 Sill	8.0000	0.0500	0.4000	
E4 Jamb	20.0000	0.0500	1.0000	
E20 Exposed floor (normal)	28.0000	0.3200	8.9600	
E7 Party floor between dwellings (in blocks of flats)	25.0000	0.0700	1.7500	
P7 Party Wall - Exposed floor (normal)	9.3000	0.1600	1.4880	
E16 Corner (normal)	9.0000	0.0900	0.8100	
E18 Party wall between dwellings	6.0000	0.0600	0.3600	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			15.2680	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	50.9511	(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	12.0813	11.9474	11.8135	11.1438	11.0099	10.3402	10.3402	10.2063	10.6081	11.0099	11.2777	11.5456	(38)
Heat transfer coeff	63.0324	62.8985	62.7645	62.0949	61.9610	61.2913	61.2913	61.1574	61.5592	61.9610	62.2288	62.4967	(39)
Average = Sum(39)m / 12 =												62.0614	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8081	0.8064	0.8047	0.7961	0.7944	0.7858	0.7858	0.7841	0.7892	0.7944	0.7978	0.8012	(40)
HLP (average)												0.7957	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4238 (42)

Hot water usage for mixer showers

71.1230	70.0342	68.4294	65.9608	63.7490	60.6547	58.2073	61.0684	62.5075	65.5723	68.7640	71.0589	(42a)

Hot water usage for baths

27.3903	26.9768	26.3886	25.5077	24.7138	23.6210	22.7919	23.8057	24.3378	25.4207	26.5465	27.3685	(42b)

Hot water usage for other uses

39.4523	38.0177	36.5831	35.1484	33.7138	32.2792	32.2792	33.7138	35.1484	36.5831	38.0177	39.4523	(42c)

Average daily hot water use (litres/day) 126.8329 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.9656	135.0286	131.4011	126.6169	122.1766	116.5548	113.2783	118.5879	121.9937	127.5760	133.3281	137.8798	(44)
Energy conte	203.1092	178.6702	187.7694	165.3934	157.4369	134.7918	125.1759	139.5802	141.5066	164.3945	180.1974	202.4865	(45)
Energy content (annual)										Total = Sum(45)m =		1980.5120	

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

30.4664	26.8005	28.1654	24.8090	23.6155	20.2188	18.7764	20.9370	21.2260	24.6592	27.0296	30.3730	(46)

Water storage loss:

Store volume 150.0000 (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

256.5036	226.8974	241.1638	217.0654	210.8313	186.4638	178.5703	192.9746	193.1786	217.7889	231.8694	255.8809	(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

256.5036	226.8974	241.1638	217.0654	210.8313	186.4638	178.5703	192.9746	193.1786	217.7889	231.8694	255.8809	(64)
									Total per year (kWh/year) = Sum(64)m =		2609.1880	(64)
12Total per year (kWh/year)											2609	(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

110.2493	97.9896	105.1489	96.3309	95.0633	86.1559	84.3365	89.1259	88.3885	97.3767	101.2532	110.0423	(65)

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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	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.1312	128.5739	116.1312	120.0023	116.1312	120.0023	116.1312	116.1312	120.0023	116.1312	120.0023	116.1312	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.2098	217.4430	211.8154	199.8349	184.7117	170.4980	161.0024	158.7692	164.3968	176.3773	191.5005	205.7142	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	(71)
Water heating gains (Table 5)	148.1846	145.8178	141.3291	133.7929	127.7733	119.6609	113.3555	119.7929	122.7619	130.8827	140.6295	147.9063	(72)
Total internal gains	541.8829	554.1920	531.6330	515.9874	490.9734	469.5184	449.8464	454.0506	466.5182	485.7484	514.4895	532.1090	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.1400	10.6334	0.4000	0.7000	0.7700	6.4788	(74)
South	6.2000	46.7521	0.4000	0.7000	0.7700	56.2450	(78)
West	3.3000	19.6403	0.4000	0.7000	0.7700	12.5763	(80)

Solar gains	75.3000	129.0979	178.8925	225.5009	256.1355	255.8598	246.0192	222.9151	194.9903	143.2849	90.3430	64.3440	(83)
Total gains	617.1829	683.2899	710.5255	741.4882	747.1090	725.3782	695.8655	676.9656	661.5085	629.0334	604.8326	596.4530	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.4044	74.5628	74.7219	75.5278	75.6910	76.5180	76.5180	76.6855	76.1850	75.6910	75.3652	75.0422	
alpha	5.9603	5.9709	5.9815	6.0352	6.0461	6.1012	6.1012	6.1124	6.0790	6.0461	6.0243	6.0028	
util living area	0.9824	0.9668	0.9393	0.8635	0.7276	0.5349	0.3868	0.4144	0.6258	0.8682	0.9621	0.9852	(86)
MIT	20.2625	20.4180	20.5987	20.8159	20.9459	20.9929	20.9992	20.9987	20.9822	20.8371	20.5311	20.2349	(87)
Th 2	20.2463	20.2478	20.2493	20.2567	20.2582	20.2657	20.2657	20.2672	20.2627	20.2582	20.2552	20.2523	(88)
util rest of house	0.9782	0.9592	0.9256	0.8355	0.6813	0.4759	0.3226	0.3490	0.5650	0.8358	0.9521	0.9816	(89)
MIT 2	19.5830	19.7354	19.9098	20.1147	20.2230	20.2623	20.2654	20.2667	20.2534	20.1377	19.8532	19.5609	(90)
Living area fraction										fLA = Living area / (4) =		0.3590	(91)
MIT	19.8269	19.9805	20.1571	20.3664	20.4825	20.5246	20.5288	20.5295	20.5150	20.3888	20.0965	19.8029	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6769	19.8305	20.0071	20.2164	20.3325	20.3746	20.3788	20.3795	20.3650	20.2388	19.9465	19.6529	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9742	0.9542	0.9206	0.8338	0.6861	0.4848	0.3326	0.3591	0.5737	0.8349	0.9472	0.9781	(94)
Useful gains	601.2807	652.0081	654.0771	618.2557	512.6160	351.6419	231.4202	243.0762	379.4795	525.1670	572.9056	583.3646	(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	969.2419	939.1038	847.7663	702.6922	534.8762	353.9302	231.6082	243.3764	385.6670	597.2302	799.4252	965.7535	(97)
Space heating kWh	273.7631	192.9283	144.1048	60.7943	16.5616	0.0000	0.0000	0.0000	0.0000	53.6150	163.0941	284.4973	(98a)
Space heating requirement - total per year (kWh/year)												1189.3585	
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	273.7631	192.9283	144.1048	60.7943	16.5616	0.0000	0.0000	0.0000	0.0000	53.6150	163.0941	284.4973	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1189.3585	
Space heating per m2										(98c) / (4) =		15.2482	(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 %)												88.8000	(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	273.7631	192.9283	144.1048	60.7943	16.5616	0.0000	0.0000	0.0000	0.0000	53.6150	163.0941	284.4973	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	308.2918	217.2616	162.2802	68.4621	18.6505	0.0000	0.0000	0.0000	0.0000	60.3773	183.6645	320.3799	(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	256.5036	226.8974	241.1638	217.0654	210.8313	186.4638	178.5703	192.9746	193.1786	217.7889	231.8694	255.8809	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.2061	83.6983	82.9444	81.6097	80.3934	79.8000	79.8000	79.8000	79.8000	81.4304	83.2856	84.2981	(217)
Fuel for water heating, kWh/month	304.6141	271.0897	290.7538	265.9798	262.2494	233.6639	223.7723	241.8228	242.0785	267.4542	278.4027	303.5430	(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	27.6710	24.9931	27.6710	26.7783	27.6710	26.7783	27.6710	27.6710	26.7783	27.6710	26.7783	27.6710	(231)
Lighting	22.4529	18.0125	16.2183	11.8822	9.1782	7.4986	8.3726	10.8831	14.1360	18.5472	20.9491	23.0769	(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	1339.3677	(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	3185.4240	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)
mechanical ventilation fans (SFP = 0.8400) 239.8032 (230a)

central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	325.8032	(231)
Electricity for lighting (calculated in Appendix L)	181.2077	(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	5031.8026	(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	1339.3677	0.2100	281.2672	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3185.4240	0.2100	668.9390	(264)
Space and water heating			950.2063	(265)
Pumps, fans and electric keep-hot	325.8032	0.1387	45.1929	(267)
Energy for lighting	181.2077	0.1443	26.1539	(268)
Total CO2, kg/year			1021.5531	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.1000	(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	1339.3677	1.1300	1513.4855	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3185.4240	1.1300	3599.5291	(278)
Space and water heating			5113.0146	(279)
Pumps, fans and electric keep-hot	325.8032	1.5128	492.8751	(281)
Energy for lighting	181.2077	1.5338	277.9425	(282)
Total Primary energy kWh/year			5883.8322	(286)
Dwelling Primary energy Rate (DPER)			75.4300	(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		78.0000 (1b)	x	3.0000 (2b)	=	234.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	234.0000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.1282	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3782	(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) =	0.3498	(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	0.4460	0.4373	0.4286	0.3848	0.3761	0.3323	0.3323	0.3236	0.3498	0.3761	0.3936	0.4111	(22b)
Effective ac	0.5995	0.5956	0.5918	0.5740	0.5707	0.5552	0.5552	0.5524	0.5612	0.5707	0.5774	0.5845	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			12.6400	1.1450	14.4733			(27)
Heatloss Floor 1			78.0000	0.1300	10.1400			(28b)
South	29.0000	6.2000	22.8000	0.1800	4.1040			(29a)
North	29.0000	3.1400	25.8600	0.1800	4.6548			(29a)
West	28.0000	5.5000	22.5000	0.1800	4.0500			(29a)
Wall to Common	28.0000		28.0000	0.1800	5.0400			(29a)
External Roof 1	6.0000		6.0000	0.1100	0.6600			(30)
Total net area of external elements Aum(A, m2)			198.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.3221			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 196.4564 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.0000	0.0500	0.5000
E3 Sill	8.0000	0.0500	0.4000
E4 Jamb	20.0000	0.0500	1.0000
E20 Exposed floor (normal)	28.0000	0.3200	8.9600
E7 Party floor between dwellings (in blocks of flats)	25.0000	0.0700	1.7500
P7 Party Wall - Exposed floor (normal)	9.3000	0.1600	1.4880
E16 Corner (normal)	9.0000	0.0900	0.8100
E18 Party wall between dwellings	6.0000	0.0600	0.3600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.2680 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 60.5901 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2917	45.9934	45.7010	44.3277	44.0708	42.8747	42.8747	42.6532	43.3354	44.0708	44.5906	45.1340	(38)
Heat transfer coeff	106.8818	106.5835	106.2911	104.9178	104.6609	103.4648	103.4648	103.2432	103.9255	104.6609	105.1807	105.7241	(39)
Average = Sum(39)m / 12 =												104.9166	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3703	1.3665	1.3627	1.3451	1.3418	1.3265	1.3265	1.3236	1.3324	1.3418	1.3485	1.3554	(40)
HLP (average)												1.3451	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4238 (42)

Hot water usage for mixer showers

64.8591	63.8844	62.4641	59.7465	57.7410	55.5045	54.2333	55.6429	57.1881	59.5894	62.3653	64.6106	(42a)

Hot water usage for baths

28.0148	27.5987	27.0128	25.9325	25.1236	24.2267	23.7422	24.3240	24.9575	25.9172	27.0198	27.9201	(42b)

Hot water usage for other uses

39.4523	38.0177	36.5831	35.1484	33.7138	32.2792	32.2792	33.7138	35.1484	36.5831	38.0177	39.4523	(42c)

Average daily hot water use (litres/day) 121.6378 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.3262	129.5008	126.0600	120.8275	116.5785	112.0104	110.2546	113.6807	117.2939	122.0897	127.4028	131.9830	(44)
Energy conte	209.5724	184.4075	193.7495	165.4068	156.9370	137.7298	133.3434	140.7604	144.6352	165.6745	181.5086	206.6535	(45)
Energy content (annual)										Total = Sum(45)m =		2020.3786	
Distribution loss (46)m = 0.15 x (45)m	31.4359	27.6611	29.0624	24.8110	23.5406	20.6595	20.0015	21.1141	21.6953	24.8512	27.2263	30.9980	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	256.1673	226.4932	240.3444	210.4986	203.5319	182.8217	179.9383	187.3553	189.7270	212.2694	226.6004	253.2484	(62)
WWHRS	-29.6509	-26.2235	-27.4597	-22.7377	-21.1908	-18.1331	-16.9969	-18.0745	-18.7612	-22.1174	-25.0563	-29.1018	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	226.5164	200.2697	212.8846	187.7609	182.3412	164.6886	162.9415	169.2808	170.9658	190.1521	201.5441	224.1466	(64)
										Total per year (kWh/year) = Sum(64)m =		2293.4923	(64)
12Total per year (kWh/year)												2293	(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	106.9587	94.9841	101.6976	91.0712	89.4575	81.8686	81.6126	84.0788	84.1647	92.3627	96.4251	105.9882	(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	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.9645	125.0678	112.9645	116.7300	112.9645	116.7300	112.9645	112.9645	116.7300	112.9645	116.7300	112.9645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.2098	217.4430	211.8154	199.8349	184.7117	170.4980	161.0024	158.7692	164.3968	176.3773	191.5005	205.7142	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	(71)
Water heating gains (Table 5)	143.7618	141.3453	136.6904	126.4878	120.2385	113.7064	109.6944	113.0091	116.8954	124.1434	133.9237	142.4573	(72)
Total internal gains	534.2933	546.2134	523.8275	505.4100	480.2720	460.2917	443.0185	444.1000	457.3794	475.8424	504.5115	523.4932	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.1400	10.6334	0.6300	0.7000	0.7700	10.2041	(74)
South	6.2000	46.7521	0.6300	0.7000	0.7700	88.5858	(78)
West	3.3000	19.6403	0.6300	0.7000	0.7700	19.8077	(80)

Solar gains	118.5976	203.3293	281.7557	355.1639	403.4134	402.9792	387.4802	351.0912	307.1097	225.6738	142.2903	101.3418	(83)
Total gains	652.8909	749.5427	805.5832	860.5739	883.6854	863.2708	830.4987	795.1912	764.4891	701.5162	646.8017	624.8350	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.8249	39.9363	40.0462	40.5704	40.6700	41.1402	41.1402	41.2284	40.9578	40.6700	40.4690	40.2610	
alpha	3.6550	3.6624	3.6697	3.7047	3.7113	3.7427	3.7427	3.7486	3.7305	3.7113	3.6979	3.6841	
util living area													
	0.9838	0.9723	0.9536	0.9091	0.8240	0.6745	0.5205	0.5591	0.7627	0.9203	0.9721	0.9861	(86)
MIT	19.1967	19.4407	19.7781	20.2271	20.6108	20.8728	20.9634	20.9517	20.7868	20.2969	19.6789	19.1635	(87)
Th 2	19.7862	19.7891	19.7920	19.8057	19.8082	19.8202	19.8202	19.8224	19.8156	19.8082	19.8031	19.7977	(88)
util rest of house													
	0.9795	0.9651	0.9410	0.8831	0.7715	0.5802	0.3932	0.4323	0.6800	0.8921	0.9635	0.9824	(89)
MIT 2	17.7293	18.0389	18.4640	19.0235	19.4683	19.7401	19.8066	19.8028	19.6642	19.1198	18.3527	17.6947	(90)
Living area fraction										fLA = Living area / (4) =		0.3590	(91)
MIT	18.2561	18.5421	18.9357	19.4555	19.8784	20.1467	20.2219	20.2152	20.0672	19.5424	18.8288	18.2220	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2561	18.5421	18.9357	19.4555	19.8784	20.1467	20.2219	20.2152	20.0672	19.5424	18.8288	18.2220	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9720	0.9552	0.9296	0.8740	0.7750	0.6083	0.4383	0.4767	0.6995	0.8843	0.9541	0.9756	(94)
Useful gains	634.5812	715.9401	748.8470	752.1040	684.8692	525.1171	364.0270	379.0860	534.7782	620.3849	617.1145	609.5801	(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													
	1491.6500	1454.0282	1321.8061	1107.4649	855.9629	573.8847	374.7344	393.8923	620.1407	935.9147	1233.6395	1482.4610	(97)
Space heating kWh													
	637.6592	495.9952	426.2815	255.8599	127.2937	0.0000	0.0000	0.0000	0.0000	234.7542	443.8980	649.4234	(98a)
Space heating requirement - total per year (kWh/year)												3271.1651	
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													
	637.6592	495.9952	426.2815	255.8599	127.2937	0.0000	0.0000	0.0000	0.0000	234.7542	443.8980	649.4234	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3271.1651	
Space heating per m2											(98c) / (4) =	41.9380	(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													
	637.6592	495.9952	426.2815	255.8599	127.2937	0.0000	0.0000	0.0000	0.0000	234.7542	443.8980	649.4234	(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)													
	690.8551	537.3729	461.8435	277.2046	137.9130	0.0000	0.0000	0.0000	0.0000	254.3382	480.9296	703.6006	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	226.5164	200.2697	212.8846	187.7609	182.3412	164.6886	162.9415	169.2808	170.9658	190.1521	201.5441	224.1466	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.2502	86.0098	85.5851	84.7543	83.2695	79.8000	79.8000	79.8000	79.8000	84.5335	85.7791	86.3025	(217)
Fuel for water heating, kWh/month													
	262.6270	232.8451	248.7403	221.5356	218.9770	206.3767	204.1873	212.1314	214.2429	224.9430	234.9571	259.7219	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	23.4718	18.8299	16.9543	12.4214	9.5947	7.8389	8.7526	11.3769	14.7775	19.3889	21.8997	24.1241	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.4082	-38.3633	-56.7994	-65.8408	-72.7003	-68.4715	-67.6299	-63.0084	-55.1352	-44.7495	-29.4322	-22.7009	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-11.6609	-24.8439	-49.9667	-75.9120	-101.2227	-102.0192	-100.8212	-84.9779	-61.7760	-35.8160	-15.6611	-9.1980	(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	3544.0575	(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	2741.2851	(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)	189.4308	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1285.1151	(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	5275.6583	(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	3544.0575	0.2100	744.2521	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2741.2851	0.2100	575.6699	(264)
Space and water heating			1319.9220	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	189.4308	0.1443	27.3407	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-611.2397	0.1340	-81.8820	
PV Unit electricity exported	-673.8755	0.1256	-84.6115	
Total			-166.4936	(269)
Total CO2, kg/year			1192.6984	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.2900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3544.0575	1.1300	4004.7850	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2741.2851	1.1300	3097.6522	(278)
Space and water heating			7102.4372	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	189.4308	1.5338	290.5553	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-611.2397	1.4951	-913.8402	
PV Unit electricity exported	-673.8755	0.4609	-310.5717	
Total			-1224.4120	(283)
Total Primary energy kWh/year			6298.6814	(286)
Target Primary Energy Rate (TPER)			80.7500	(287)

Summary for Input Data

elmhurst energy

Property Reference	3-G-N Gas	**Issued on Date**	05/02/2024
Assessment Reference	3-G-N Gas	**Prop Type Ref**	3-G-N Gas
Property			

SAP Rating	82 B	**DER**	17.10	**TER**	19.55
Environmental	88 B	**% DER < TER**			12.53
CO_2 Emissions (t/year)	0.85	**DFEE**	52.60	**TFEE**	60.66
Compliance Check	See BREL	**% DFEE < TFEE**			13.29
% DPER < TPER	6.23	**DPER**	97.37	**TPER**	103.84

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	22.00 m	54.30 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	23.20	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	20.00	16.00	0.00	None	4.00	Enter Gross Area
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	18.00	14.86	0.00	None	3.14	Enter Gross Area
West	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	28.00	22.60	0.00	None	5.40	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	6.00	6.00	2.50	Stairwell Stairwell 2	0.00	Enter Gross Area
Wall to Stores	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	42.00	42.00	0.70	Garage Single 1 Inside	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)

Internal Wall 1		Plasterboard on timber frame							9.00	54.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	6.00	6.00	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling	Concrete floor slab, carpeted	100.00	48.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Exposed Floor - Solid	Lowest occupied	Other	0.11	None	0.00	0.00	55.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
North	Window	North	North	4.00	0
West	Window	West	East	3.20	0
South	Window	South	South	3.14	0
Door	Door	West	West	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	8.50	0.05	0.05	No
E3 Sill	Independently assessed	6.50	0.05	0.05	No
E4 Jamb	Independently assessed	22.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	22.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	22.00	0.07	0.07	No
P7 Party Wall - Exposed floor (normal)	Independently assessed	14.50	0.16	0.16	No
E16 Corner (normal)	Independently assessed	9.00	0.09	0.09	No
E18 Party wall between dwellings	Independently assessed	12.00	0.06	0.06	No

Y-value	0.08	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)

Summary for Input Data

elmhurst energy

Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	Manufacturer	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	102	
In Winter	88.80	
In Summer	79.80	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2106	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	

25.0 Main Heating 2	None

26.0 Heat Networks	None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From header tank

Summary for Input Data

Bath Count	1	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	3-G-N Gas	**Issued on Date**	05/02/2024
Assessment Reference	3-G-N Gas	**Prop Type Ref**	3-G-N Gas
Property			

SAP Rating	82 B	**DER**	17.10	**TER**	19.55
Environmental	88 B	**% DER < TER**			12.53
CO_2 Emissions (t/year)	0.85	**DFEE**	52.60	**TFEE**	60.66
Compliance Check	See BREL	**% DFEE < TFEE**			13.29
% DPER < TPER	6.23	**DPER**	97.37	**TPER**	103.84

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.3000	(1b)	x 3.0000	(2b) =	162.9000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.3000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		162.9000	(5)

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2. Ventilation rate

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	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	0 * 10 =	0.0000 (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) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		1.5000 (17)
Infiltration rate		0.0750 (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) =	0.0694 (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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	86.4000 (23c)

Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			10.3400	0.8687	8.9826			(27)
Door			2.2000	1.1000	2.4200			(26)
Heatloss Floor 1			55.0000	0.1100	6.0500			(28b)
North	20.0000	4.0000	16.0000	0.1400	2.2400	110.0000	1760.0000	(29a)
South	18.0000	3.1400	14.8600	0.1400	2.0804	110.0000	1634.6000	(29a)
West	28.0000	5.4000	22.6000	0.1400	3.1640	110.0000	2486.0000	(29a)
Wall to Common	6.0000		6.0000	0.1100	0.6600	14.0000	84.0000	(29a)
Wall to Stores	42.0000		42.0000	0.1300	5.4600	110.0000	4620.0000	(29a)
External Roof 1	6.0000		6.0000	0.1100	0.6600	9.0000	54.0000	(30)
Total net area of external elements Aum(A, m2)			175.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.7170			(33)
Party Ceiling			48.0000			100.0000	4800.0000	(32b)
Internal Wall 1			54.0000			9.0000	486.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15924.6000 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 293.2707 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3	Sill	6.5000	0.0500	0.3250
E4	Jamb	22.0000	0.0500	1.1000
E20	Exposed floor (normal)	22.0000	0.3200	7.0400
E7	Party floor between dwellings (in blocks of flats)	22.0000	0.0700	1.5400
P7	Party Wall - Exposed floor (normal)	14.5000	0.1600	2.3200
E16	Corner (normal)	9.0000	0.0900	0.8100
E18	Party wall between dwellings	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.2800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 45.9970 (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	8.4105	8.3172	8.2240	7.7578	7.6646	7.1984	7.1984	7.1052	7.3849	7.6646	7.8510	8.0375	(38)
Heat transfer coeff	54.4075	54.3142	54.2210	53.7548	53.6616	53.1954	53.1954	53.1022	53.3819	53.6616	53.8481	54.0345	(39)

Average = Sum(39)m / 12 = 53.7315

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0020	1.0003	0.9985	0.9900	0.9882	0.9797	0.9797	0.9779	0.9831	0.9882	0.9917	0.9951	(40)
HLP (average)												0.9895	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8168 (42)
Hot water usage for mixer showers

59.9626	59.0446	57.6917	55.6104	53.7457	51.1369	49.0736	51.4858	52.6990	55.2829	57.9737	59.9086	(42a)

Hot water usage for baths

23.1112	22.7623	22.2660	21.5227	20.8529	19.9307	19.2312	20.0866	20.5356	21.4493	22.3992	23.0928	(42b)

Hot water usage for other uses

33.2361	32.0275	30.8189	29.6103	28.4017	27.1931	27.1931	28.4017	29.6103	30.8189	32.0275	33.2361	(42c)

Average daily hot water use (litres/day) 106.9250 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	116.3099	113.8344	110.7766	106.7435	103.0003	98.2608	95.4979	99.9741	102.8449	107.5510	112.4004	116.2375	(44)
Energy conte	171.2282	150.6259	158.2974	139.4336	132.7263	113.6354	105.5280	117.6714	119.2949	138.5904	151.9129	170.7032	(45)

Energy content (annual) Total = Sum(45)m = 1669.6475
Distribution loss (46)m = 0.15 x (45)m

25.6842	22.5939	23.7446	20.9150	19.9089	17.0453	15.8292	17.6507	17.8942	20.7886	22.7869	25.6055	(46)

Water storage loss:
Store volume 150.0000 (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

224.6226	198.8531	211.6918	191.1056	186.1207	165.3074	158.9224	171.0658	170.9669	191.9848	203.5849	224.0976	(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

224.6226	198.8531	211.6918	191.1056	186.1207	165.3074	158.9224	171.0658	170.9669	191.9848	203.5849	224.0976	(64)

Total per year (kWh/year) = Sum(64)m = 2298.3235 (64)
12Total per year (kWh/year) 2298 (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

99.6489	88.6649	95.3494	87.6993	86.8470	79.1214	77.8036	81.8412	81.0032	88.7968	91.8486	99.4743	(65)

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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	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	82.6947	91.5549	82.6947	85.4512	82.6947	85.4512	82.6947	82.6947	85.4512	82.6947	85.4512	82.6947	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	158.3798	160.0233	155.8818	147.0649	135.9353	125.4749	118.4868	116.8433	120.9848	129.8017	140.9314	151.3917	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	(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)	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	(71)
Water heating gains (Table 5)	133.9367	131.9418	128.1578	121.8046	116.7299	109.8908	104.5747	110.0017	112.5044	119.3506	127.5676	133.7021	(72)
Total internal gains	428.2635	436.7723	419.9866	407.5730	388.6121	371.0692	356.0085	359.7920	369.1928	385.0993	407.2024	421.0408	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.0000	10.6334	0.4000	0.7000	0.7700	8.2532	(74)
East	3.2000	19.6403	0.4000	0.7000	0.7700	12.1952	(76)
South	3.1400	46.7521	0.4000	0.7000	0.7700	28.4854	(78)

Solar gains	48.9338	86.2804	125.5150	167.5128	198.2031	201.3218	192.2087	168.6823	139.9946	97.4007	59.1522	41.5230	(83)
Total gains	477.1973	523.0526	545.5017	575.0858	586.8152	572.3910	548.2172	528.4743	509.1873	482.5000	466.3547	462.5638	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.3032	81.4427	81.5828	82.2903	82.4333	83.1556	83.1556	83.3017	82.8652	82.4333	82.1478	81.8643	
alpha	6.4202	6.4295	6.4389	6.4860	6.4956	6.5437	6.5437	6.5534	6.5243	6.4956	6.4765	6.4576	
util living area	0.9923	0.9849	0.9688	0.9134	0.7873	0.5866	0.4260	0.4606	0.6969	0.9207	0.9819	0.9937	(86)
MIT	20.2261	20.3607	20.5414	20.7770	20.9339	20.9916	20.9991	20.9985	20.9759	20.7971	20.4822	20.2020	(87)
Th 2	20.0817	20.0831	20.0845	20.0917	20.0931	20.1003	20.1003	20.1018	20.0974	20.0931	20.0903	20.0874	(88)
util rest of house	0.9896	0.9797	0.9580	0.8851	0.7304	0.5081	0.3395	0.3716	0.6171	0.8889	0.9746	0.9914	(89)
MIT 2	19.3944	19.5276	19.7037	19.9267	20.0543	20.0971	20.1001	20.1014	20.0869	19.9496	19.6538	19.3753	(90)
Living area fraction									fLA = Living area / (4) =			0.4273	(91)
MIT	19.7498	19.8836	20.0616	20.2900	20.4301	20.4793	20.4842	20.4847	20.4667	20.3117	20.0078	19.7285	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5998	19.7336	19.9116	20.1400	20.2801	20.3293	20.3342	20.3347	20.3167	20.1617	19.8578	19.5785	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9878	0.9773	0.9555	0.8868	0.7429	0.5284	0.3620	0.3948	0.6373	0.8917	0.9723	0.9898	(94)
Useful gains	471.3830	511.1615	521.2346	509.9995	435.9314	302.4478	198.4780	208.6524	324.4889	430.2355	453.4552	457.8373	(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	832.4215	805.6740	727.1905	604.2037	460.4241	304.7729	198.6432	208.9414	331.8596	513.0957	686.9807	830.9706	(97)
Space heating kWh	268.6126	197.9124	153.2312	67.8270	18.2226	0.0000	0.0000	0.0000	0.0000	61.6480	168.1384	277.6112	(98a)
Space heating requirement - total per year (kWh/year)												1213.2034	
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	268.6126	197.9124	153.2312	67.8270	18.2226	0.0000	0.0000	0.0000	0.0000	61.6480	168.1384	277.6112	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1213.2034	
Space heating per m2											(98c) / (4) =	22.3426	(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 %)												88.8000	(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	268.6126	197.9124	153.2312	67.8270	18.2226	0.0000	0.0000	0.0000	0.0000	61.6480	168.1384	277.6112	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	302.4917	222.8743	172.5577	76.3818	20.5209	0.0000	0.0000	0.0000	0.0000	69.4234	189.3450	312.6253	(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	224.6226	198.8531	211.6918	191.1056	186.1207	165.3074	158.9224	171.0658	170.9669	191.9848	203.5849	224.0976	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.4619	84.0491	83.3470	81.9764	80.5278	79.8000	79.8000	79.8000	79.8000	81.8155	83.6341	84.5411	(217)
Fuel for water heating, kWh/month	265.9455	236.5914	253.9884	233.1228	231.1259	207.1521	199.1508	214.3681	214.2443	234.6558	243.4234	265.0752	(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	21.4826	19.4036	21.4826	20.7896	21.4826	20.7896	21.4826	21.4826	20.7896	21.4826	20.7896	21.4826	(231)
Lighting	15.9883	12.8264	11.5487	8.4611	6.5356	5.3396	5.9620	7.7496	10.0660	13.2071	14.9174	16.4326	(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												1366.2201	(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												2798.8438	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)

mechanical ventilation fans (SFP = 0.8400)	166.9399	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	252.9399	(231)
Electricity for lighting (calculated in Appendix L)	129.0344	(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	4547.0382	(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	1366.2201	0.2100	286.9062	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2798.8438	0.2100	587.7572	(264)
Space and water heating			874.6634	(265)
Pumps, fans and electric keep-hot	252.9399	0.1387	35.0859	(267)
Energy for lighting	129.0344	0.1443	18.6236	(268)
Total CO2, kg/year			928.3730	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			17.1000	(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	1366.2201	1.1300	1543.8287	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2798.8438	1.1300	3162.6935	(278)
Space and water heating			4706.5222	(279)
Pumps, fans and electric keep-hot	252.9399	1.5128	382.6475	(281)
Energy for lighting	129.0344	1.5338	197.9172	(282)
Total Primary energy kWh/year			5287.0870	(286)
Dwelling Primary energy Rate (DPER)			97.3700	(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	54.3000	(1b)	x 3.0000	(2b) =	162.9000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		162.9000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1228	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3728	(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) = 0.3448	(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	0.4396	0.4310	0.4224	0.3793	0.3707	0.3276	0.3276	0.3190	0.3448	0.3707	0.3879	0.4052	(22b)
Effective ac	0.5966	0.5929	0.5892	0.5719	0.5687	0.5537	0.5537	0.5509	0.5594	0.5687	0.5752	0.5821	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			10.3400	1.1450	11.8397			(27)
Heatloss Floor 1			55.0000	0.1300	7.1500			(28b)
North	20.0000	4.0000	16.0000	0.1800	2.8800			(29a)
South	18.0000	3.1400	14.8600	0.1800	2.6748			(29a)
West	28.0000	5.4000	22.6000	0.1800	4.0680			(29a)
Wall to Common	6.0000		6.0000	0.1800	1.0800			(29a)
Wall to Stores	42.0000		42.0000	0.1800	7.5600			(29a)
External Roof 1	6.0000		6.0000	0.1100	0.6600			(30)
Total net area of external elements Aum(A, m2)			175.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1125			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 275.5912 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3 Sill	6.5000	0.0500	0.3250
E4 Jamb	22.0000	0.0500	1.1000
E20 Exposed floor (normal)	22.0000	0.3200	7.0400
E7 Party floor between dwellings (in blocks of flats)	22.0000	0.0700	1.5400
P7 Party Wall - Exposed floor (normal)	14.5000	0.1600	2.3200
E16 Corner (normal)	9.0000	0.0900	0.8100
E18 Party wall between dwellings	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.2800 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 54.3925 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.0737	31.8720	31.6742	30.7454	30.5717	29.7627	29.7627	29.6129	30.0743	30.5717	30.9232	31.2907	(38)
Heat transfer coeff	86.4662	86.2645	86.0667	85.1379	84.9642	84.1552	84.1552	84.0054	84.4668	84.9642	85.3157	85.6832	(39)
Average = Sum(39)m / 12 =												85.1371	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5924	1.5887	1.5850	1.5679	1.5647	1.5498	1.5498	1.5471	1.5556	1.5647	1.5712	1.5780	(40)
HLP (average)												1.5679	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8168 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	54.6816	53.8599	52.6624	50.3713	48.6805	46.7949	45.7232	46.9116	48.2143	50.2388	52.5791	54.4721	(42a)
Hot water usage for baths	23.6381	23.2871	22.7927	21.8812	21.1986	20.4418	20.0330	20.5239	21.0584	21.8683	22.7986	23.5582	(42b)
Hot water usage for other uses	33.2361	32.0275	30.8189	29.6103	28.4017	27.1931	27.1931	28.4017	29.6103	30.8189	32.0275	33.2361	(42c)
Average daily hot water use (litres/day)												102.5455	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.5558	109.1744	106.2740	101.8628	98.2808	94.4299	92.9493	95.8372	98.8830	102.9260	107.4052	111.2664	(44)
Energy conte	176.6771	155.4629	163.3392	139.4450	132.3049	116.1126	112.4142	118.6665	121.9327	139.6695	153.0184	174.2163	(45)
Energy content (annual)										Total = Sum(45)m =		1703.2592	
Distribution loss (46)m = 0.15 x (45)m	26.5016	23.3194	24.5009	20.9168	19.8457	17.4169	16.8621	17.8000	18.2899	20.9504	22.9528	26.1324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	223.2720	197.5486	209.9341	184.5369	178.8998	161.2044	159.0091	165.2614	167.0245	186.2644	198.1102	220.8112	(62)
WWHRS	-24.9982	-22.1086	-23.1508	-19.1698	-17.8656	-15.2877	-14.3298	-15.2383	-15.8172	-18.6468	-21.1245	-24.5352	(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	198.2739	175.4401	186.7833	165.3671	161.0343	145.9167	144.6793	150.0231	151.2073	167.6177	176.9857	196.2760	(64)
										Total per year (kWh/year) = Sum(64)m =		2019.6042	(64)
12Total per year (kWh/year)												2020	(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	96.0211	85.3600	91.5862	82.4389	81.2673	74.6809	74.6536	76.7325	76.6161	83.7160	86.9521	95.2028	(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	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	80.9187	89.5886	80.9187	83.6160	80.9187	83.6160	80.9187	80.9187	83.6160	80.9187	83.6160	80.9187	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	158.3798	160.0233	155.8818	147.0649	135.9353	125.4749	118.4868	116.8433	120.9848	129.8017	140.9314	151.3917	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	(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)	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	(71)
Water heating gains (Table 5)	129.0606	127.0238	123.0997	114.4985	109.2303	103.7235	100.3409	103.1351	106.4112	112.5216	120.7668	127.9608	(72)
Total internal gains													

	421.6114	429.8880	413.1525	398.4318	379.3365	363.0667	349.9987	351.1495	361.2644	376.4943	398.5664	413.5235	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.0000	10.6334	0.6300	0.7000	0.7700	12.9988	(74)
East	3.2000	19.6403	0.6300	0.7000	0.7700	19.2074	(76)
South	3.1400	46.7521	0.6300	0.7000	0.7700	44.8644	(78)

Solar gains	77.0707	135.8916	197.6862	263.8327	312.1698	317.0818	302.7287	265.6745	220.4915	153.4061	93.1648	65.3987	(83)
Total gains	498.6821	565.7796	610.8387	662.2645	691.5064	680.1485	652.7274	616.8240	581.7558	529.9004	491.7312	478.9222	(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	48.0747	48.1871	48.2978	48.8247	48.9246	49.3948	49.3948	49.4829	49.2126	48.9246	48.7230	48.5140	
alpha	4.2050	4.2125	4.2199	4.2550	4.2616	4.2930	4.2930	4.2989	4.2808	4.2616	4.2482	4.2343	
util living area	0.9925	0.9864	0.9743	0.9396	0.8597	0.7065	0.5446	0.5923	0.8114	0.9514	0.9860	0.9937	(86)
MIT	19.3869	19.5871	19.8892	20.3040	20.6660	20.9007	20.9747	20.9639	20.8106	20.3522	19.8045	19.3585	(87)
Th 2	19.6189	19.6217	19.6243	19.6369	19.6393	19.6503	19.6503	19.6524	19.6461	19.6393	19.6345	19.6295	(88)
util rest of house	0.9897	0.9813	0.9642	0.9143	0.7998	0.5909	0.3889	0.4354	0.7142	0.9257	0.9797	0.9913	(89)
MIT 2	17.8065	18.0619	18.4440	18.9613	19.3731	19.5996	19.6441	19.6422	19.5299	19.0315	18.3487	17.7774	(90)
Living area fraction										fLA = Living area / (4) =		0.4273	(91)
MIT	18.4817	18.7136	19.0615	19.5350	19.9255	20.1555	20.2126	20.2069	20.0771	19.5958	18.9707	18.4529	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4817	18.7136	19.0615	19.5350	19.9255	20.1555	20.2126	20.2069	20.0771	19.5958	18.9707	18.4529	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9864	0.9767	0.9588	0.9120	0.8142	0.6375	0.4562	0.5032	0.7492	0.9246	0.9756	0.9884	(94)
Useful gains	491.8893	552.6177	585.6769	603.9964	563.0332	433.6283	297.7987	310.3641	435.8461	489.9723	479.7084	473.3513	(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	1226.2391	1191.6196	1081.1233	905.4409	698.8748	467.5252	304.0182	319.7978	504.8642	764.3177	1012.7531	1221.2373	(97)
Space heating kWh	546.3563	429.4093	368.6121	217.0400	101.0662	0.0000	0.0000	0.0000	0.0000	204.1130	383.7922	556.4272	(98a)
Space heating requirement - total per year (kWh/year)												2806.8162	
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	546.3563	429.4093	368.6121	217.0400	101.0662	0.0000	0.0000	0.0000	0.0000	204.1130	383.7922	556.4272	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2806.8162	
Space heating per m2										(98c) / (4) =		51.6909	(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	546.3563	429.4093	368.6121	217.0400	101.0662	0.0000	0.0000	0.0000	0.0000	204.1130	383.7922	556.4272	(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)	591.9353	465.2322	399.3630	235.1463	109.4975	0.0000	0.0000	0.0000	0.0000	221.1408	415.8095	602.8463	(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	198.2739	175.4401	186.7833	165.3671	161.0343	145.9167	144.6793	150.0231	151.2073	167.6177	176.9857	196.2760	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.2110	85.9871	85.5550	84.6705	83.0455	79.8000	79.8000	79.8000	79.8000	84.5026	85.7478	86.2631	(217)
Fuel for water heating, kWh/month	229.9867	204.0307	218.3196	195.3065	193.9108	182.8530	181.3024	187.9989	189.4828	198.3579	206.4025	227.5318	(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	16.8133	13.4883	12.1447	8.8977	6.8729	5.6152	6.2696	8.1495	10.5854	13.8886	15.6872	17.2806	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.6464	-27.2298	-40.5371	-47.2765	-52.4789	-49.5590	-48.9787	-45.5094	-39.6208	-31.9129	-20.8408	-16.0147	(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	-7.8556	-16.7721	-33.7885	-51.4052	-68.5982	-69.1287	-68.2892	-57.5119	-41.7674	-24.1731	-10.5510	-6.1918	(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	3040.9709	(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	2415.4837	(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)	135.6930	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-894.6378	(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	4783.5098	(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	3040.9709	0.2100	638.6039	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2415.4837	0.2100	507.2516	(264)
Space and water heating			1145.8555	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.6930	0.1443	19.5847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-438.6052	0.1338	-58.6981	
PV Unit electricity exported	-456.0326	0.1255	-57.2456	
Total			-115.9437	(269)
Total CO2, kg/year			1061.4257	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			19.5500	(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	3040.9709	1.1300	3436.2972	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2415.4837	1.1300	2729.4966	(278)
Space and water heating			6165.7937	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.6930	1.5338	208.1305	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-438.6052	1.4946	-655.5246	
PV Unit electricity exported	-456.0326	0.4608	-210.1232	
Total			-865.6479	(283)
Total Primary energy kWh/year			5638.3772	(286)
Target Primary Energy Rate (TPER)			103.8400	(287)

Summary for Input Data

elmhurst energy

Property Reference	3-G-S Gas	**Issued on Date**	05/02/2024
Assessment Reference	3-G-S Gas	**Prop Type Ref**	3-G-S Gas
Property			

SAP Rating	82 B	**DER**	16.98	**TER**	19.35
Environmental	88 B	**% DER < TER**			12.25
CO_2 Emissions (t/year)	0.85	**DFEE**	51.98	**TFEE**	59.75
Compliance Check	See BREL	**% DFEE < TFEE**			13.01
% DPER < TPER	5.89	**DPER**	96.73	**TPER**	102.78

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	22.00 m	54.30 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	23.20	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	20.00	16.00	0.00	None	4.00	Enter Gross Area
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	18.00	14.86	0.00	None	3.14	Enter Gross Area
East	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	28.00	22.60	0.00	None	5.40	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	6.00	6.00	2.50	Stairwell Stairwell 2	0.00	Enter Gross Area
Wall to Stores	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	42.00	42.00	0.70	Garage Single 1 Inside	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)

Internal Wall 1		Plasterboard on timber frame	9.00	54.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	6.00	6.00	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling	Concrete floor slab, carpeted	100.00	48.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Exposed Floor - Solid	Lowest occupied	Other	0.11	None	0.00	0.00	55.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
South	Window	South	South	4.00	0
East	Window	East	East	3.20	0
North	Window	North	North	3.14	0
Door	Door	East	West	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	8.50	0.05	0.05	No
E3 Sill	Independently assessed	6.50	0.05	0.05	No
E4 Jamb	Independently assessed	22.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	22.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	22.00	0.07	0.07	No
P7 Party Wall - Exposed floor (normal)	Independently assessed	14.50	0.16	0.16	No
E16 Corner (normal)	Independently assessed	9.00	0.09	0.09	No
E18 Party wall between dwellings	Independently assessed	12.00	0.06	0.06	No

Y-value	0.08	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)

Summary for Input Data

elmhurst energy

Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	Manufacturer	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	102	
In Winter	88.80	
In Summer	79.80	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2106	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	

25.0 Main Heating 2	None

26.0 Heat Networks	None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From header tank

Summary for Input Data

Bath Count	1	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	3-G-S Gas	**Issued on Date**	05/02/2024
Assessment Reference	3-G-S Gas	**Prop Type Ref**	3-G-S Gas
Property			

SAP Rating	82 B	**DER**	16.98	**TER**	19.35
Environmental	88 B	**% DER < TER**			12.25
CO_2 Emissions (t/year)	0.85	**DFEE**	51.98	**TFEE**	59.75
Compliance Check	See BREL	**% DFEE < TFEE**			13.01
% DPER < TPER	5.89	**DPER**	96.73	**TPER**	102.78

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.3000	(1b)	x 3.0000	(2b) =	162.9000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	162.9000	(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	0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		1.5000	(17)
Infiltration rate		0.0750	(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) =	0.0694	(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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		86.4000 (23c)

Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(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	
Window (Uw = 0.90)			10.3400	0.8687	8.9826			(27)
Door			2.2000	1.1000	2.4200			(26)
Heatloss Floor 1			55.0000	0.1100	6.0500			(28b)
South	20.0000	4.0000	16.0000	0.1400	2.2400	110.0000	1760.0000	(29a)
North	18.0000	3.1400	14.8600	0.1400	2.0804	110.0000	1634.6000	(29a)
East	28.0000	5.4000	22.6000	0.1400	3.1640	110.0000	2486.0000	(29a)
Wall to Common	6.0000		6.0000	0.1100	0.6600	14.0000	84.0000	(29a)
Wall to Stores	42.0000		42.0000	0.1300	5.4600	110.0000	4620.0000	(29a)
External Roof 1	6.0000		6.0000	0.1100	0.6600	9.0000	54.0000	(30)
Total net area of external elements Aum(A, m2)			175.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.7170			(33)
Party Ceiling			48.0000			100.0000	4800.0000	(32b)
Internal Wall 1			54.0000			9.0000	486.0000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		15924.6000	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 293.2707 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3	Sill	6.5000	0.0500	0.3250
E4	Jamb	22.0000	0.0500	1.1000
E20	Exposed floor (normal)	22.0000	0.3200	7.0400
E7	Party floor between dwellings (in blocks of flats)	22.0000	0.0700	1.5400
P7	Party Wall - Exposed floor (normal)	14.5000	0.1600	2.3200
E16	Corner (normal)	9.0000	0.0900	0.8100
E18	Party wall between dwellings	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.2800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 45.9970 (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	8.4105	8.3172	8.2240	7.7578	7.6646	7.1984	7.1984	7.1052	7.3849	7.6646	7.8510	8.0375	(38)
Heat transfer coeff	54.4075	54.3142	54.2210	53.7548	53.6616	53.1954	53.1954	53.1022	53.3819	53.6616	53.8481	54.0345	(39)

Average = Sum(39)m / 12 = 53.7315

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0020	1.0003	0.9985	0.9900	0.9882	0.9797	0.9797	0.9779	0.9831	0.9882	0.9917	0.9951	(40)
HLP (average)												0.9895	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---
4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8168 (42)
Hot water usage for mixer showers

59.9626	59.0446	57.6917	55.6104	53.7457	51.1369	49.0736	51.4858	52.6990	55.2829	57.9737	59.9086	(42a)

Hot water usage for baths

23.1112	22.7623	22.2660	21.5227	20.8529	19.9307	19.2312	20.0866	20.5356	21.4493	22.3992	23.0928	(42b)

Hot water usage for other uses

33.2361	32.0275	30.8189	29.6103	28.4017	27.1931	27.1931	28.4017	29.6103	30.8189	32.0275	33.2361	(42c)

Average daily hot water use (litres/day) 106.9250 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	116.3099	113.8344	110.7766	106.7435	103.0003	98.2608	95.4979	99.9741	102.8449	107.5510	112.4004	116.2375	(44)
Energy conte	171.2282	150.6259	158.2974	139.4336	132.7263	113.6354	105.5280	117.6714	119.2949	138.5904	151.9129	170.7032	(45)

Energy content (annual) Total = Sum(45)m = 1669.6475
Distribution loss (46)m = 0.15 x (45)m

25.6842	22.5939	23.7446	20.9150	19.9089	17.0453	15.8292	17.6507	17.8942	20.7886	22.7869	25.6055	(46)

Water storage loss:
Store volume 150.0000 (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

224.6226	198.8531	211.6918	191.1056	186.1207	165.3074	158.9224	171.0658	170.9669	191.9848	203.5849	224.0976	(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

224.6226	198.8531	211.6918	191.1056	186.1207	165.3074	158.9224	171.0658	170.9669	191.9848	203.5849	224.0976	(64)

Total per year (kWh/year) = Sum(64)m = 2298.3235 (64)
12Total per year (kWh/year) 2298 (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

99.6489	88.6649	95.3494	87.6993	86.8470	79.1214	77.8036	81.8412	81.0032	88.7968	91.8486	99.4743	(65)

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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	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	82.6947	91.5549	82.6947	85.4512	82.6947	85.4512	82.6947	82.6947	85.4512	82.6947	85.4512	82.6947	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	158.3798	160.0233	155.8818	147.0649	135.9353	125.4749	118.4868	116.8433	120.9848	129.8017	140.9314	151.3917	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	(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)	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	(71)
Water heating gains (Table 5)	133.9367	131.9418	128.1578	121.8046	116.7299	109.8908	104.5747	110.0017	112.5044	119.3506	127.5676	133.7021	(72)
Total internal gains	428.2635	436.7723	419.9866	407.5730	388.6121	371.0692	356.0085	359.7920	369.1928	385.0993	407.2024	421.0408	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.1400	10.6334	0.4000	0.7000	0.7700	6.4788	(74)
East	3.2000	19.6403	0.4000	0.7000	0.7700	12.1952	(76)
South	4.0000	46.7521	0.4000	0.7000	0.7700	36.2871	(78)

Solar gains	54.9610	95.6665	136.0287	176.6525	204.9040	206.4219	197.7715	176.2998	150.0686	107.1455	66.2109	46.7851	(83)
Total gains	483.2246	532.4388	556.0153	584.2255	593.5161	577.4911	553.7800	536.0918	519.2614	492.2448	473.4134	467.8259	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.3032	81.4427	81.5828	82.2903	82.4333	83.1556	83.1556	83.3017	82.8652	82.4333	82.1478	81.8643	
alpha	6.4202	6.4295	6.4389	6.4860	6.4956	6.5437	6.5437	6.5534	6.5243	6.4956	6.4765	6.4576	
util living area	0.9918	0.9835	0.9659	0.9081	0.7812	0.5818	0.4218	0.4542	0.6856	0.9144	0.9804	0.9932	(86)
MIT	20.2363	20.3758	20.5566	20.7864	20.9369	20.9920	20.9991	20.9986	20.9780	20.8075	20.4934	20.2109	(87)
Th 2	20.0817	20.0831	20.0845	20.0917	20.0931	20.1003	20.1003	20.1018	20.0974	20.0931	20.0903	20.0874	(88)
util rest of house	0.9889	0.9779	0.9543	0.8788	0.7240	0.5037	0.3361	0.3664	0.6062	0.8810	0.9727	0.9909	(89)
MIT 2	19.4044	19.5422	19.7179	19.9345	20.0562	20.0973	20.1001	20.1014	20.0879	19.9581	19.6644	19.3842	(90)
Living area fraction									fLA = Living area / (4) =			0.4273	(91)
MIT	19.7598	19.8984	20.0763	20.2985	20.4325	20.4796	20.4842	20.4848	20.4682	20.3210	20.0186	19.7374	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6098	19.7484	19.9263	20.1485	20.2825	20.3296	20.3342	20.3348	20.3182	20.1710	19.8686	19.5874	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9870	0.9753	0.9519	0.8808	0.7366	0.5239	0.3584	0.3893	0.6264	0.8843	0.9704	0.9892	(94)
Useful gains	476.9624	519.3037	529.2437	514.6054	437.1973	302.5708	198.4892	208.6793	325.2450	435.2689	459.4013	462.7666	(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	832.9699	806.4785	727.9864	604.6590	460.5497	304.7862	198.6447	208.9449	331.9384	513.5950	687.5656	831.4515	(97)
Space heating kWh	264.8696	192.9814	147.8645	64.8386	17.3742	0.0000	0.0000	0.0000	0.0000	58.2746	164.2782	274.3016	(98a)
Space heating requirement - total per year (kWh/year)												1184.7828	
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	264.8696	192.9814	147.8645	64.8386	17.3742	0.0000	0.0000	0.0000	0.0000	58.2746	164.2782	274.3016	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1184.7828	
Space heating per m2											(98c) / (4) =	21.8192	(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 %)												88.8000	(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	264.8696	192.9814	147.8645	64.8386	17.3742	0.0000	0.0000	0.0000	0.0000	58.2746	164.2782	274.3016	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	298.2765	217.3214	166.5141	73.0165	19.5655	0.0000	0.0000	0.0000	0.0000	65.6246	184.9980	308.8982	(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	224.6226	198.8531	211.6918	191.1056	186.1207	165.3074	158.9224	171.0658	170.9669	191.9848	203.5849	224.0976	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.4304	83.9926	83.2707	81.9029	80.4966	79.8000	79.8000	79.8000	79.8000	81.7288	83.5830	84.5142	(217)
Fuel for water heating, kWh/month	266.0448	236.7507	254.2212	233.3320	231.2157	207.1521	199.1508	214.3681	214.2443	234.9046	243.5720	265.1596	(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	21.4826	19.4036	21.4826	20.7896	21.4826	20.7896	21.4826	21.4826	20.7896	21.4826	20.7896	21.4826	(231)
Lighting	15.9883	12.8264	11.5487	8.4611	6.5356	5.3396	5.9620	7.7496	10.0660	13.2071	14.9174	16.4326	(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												1334.2149	(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												2800.1160	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)

mechanical ventilation fans (SFP = 0.8400)	166.9399	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	252.9399	(231)
Electricity for lighting (calculated in Appendix L)	129.0344	(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	4516.3052	(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	1334.2149	0.2100	280.1851	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2800.1160	0.2100	588.0244	(264)
Space and water heating			868.2095	(265)
Pumps, fans and electric keep-hot	252.9399	0.1387	35.0859	(267)
Energy for lighting	129.0344	0.1443	18.6236	(268)
Total CO2, kg/year			921.9190	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			16.9800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1334.2149	1.1300	1507.6628	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2800.1160	1.1300	3164.1311	(278)
Space and water heating			4671.7939	(279)
Pumps, fans and electric keep-hot	252.9399	1.5128	382.6475	(281)
Energy for lighting	129.0344	1.5338	197.9172	(282)
Total Primary energy kWh/year			5252.3586	(286)
Dwelling Primary energy Rate (DPER)			96.7300	(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	54.3000 (1b)	x	3.0000 (2b)	=	162.9000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 54.3000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	162.9000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1228	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3728	(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) =	0.3448	(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	0.4396	0.4310	0.4224	0.3793	0.3707	0.3276	0.3276	0.3190	0.3448	0.3707	0.3879	0.4052	(22b)
Effective ac	0.5966	0.5929	0.5892	0.5719	0.5687	0.5537	0.5537	0.5509	0.5594	0.5687	0.5752	0.5821	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			10.3400	1.1450	11.8397			(27)
Heatloss Floor 1			55.0000	0.1300	7.1500			(28b)
South	20.0000	4.0000	16.0000	0.1800	2.8800			(29a)
North	18.0000	3.1400	14.8600	0.1800	2.6748			(29a)
East	28.0000	5.4000	22.6000	0.1800	4.0680			(29a)
Wall to Common	6.0000		6.0000	0.1800	1.0800			(29a)
Wall to Stores	42.0000		42.0000	0.1800	7.5600			(29a)
External Roof 1	6.0000		6.0000	0.1100	0.6600			(30)
Total net area of external elements Aum(A, m2)			175.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1125			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 275.5912 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3 Sill	6.5000	0.0500	0.3250
E4 Jamb	22.0000	0.0500	1.1000
E20 Exposed floor (normal)	22.0000	0.3200	7.0400
E7 Party floor between dwellings (in blocks of flats)	22.0000	0.0700	1.5400
P7 Party Wall - Exposed floor (normal)	14.5000	0.1600	2.3200
E16 Corner (normal)	9.0000	0.0900	0.8100
E18 Party wall between dwellings	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.2800 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 54.3925 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.0737	31.8720	31.6742	30.7454	30.5717	29.7627	29.7627	29.6129	30.0743	30.5717	30.9232	31.2907	(38)
Heat transfer coeff	86.4662	86.2645	86.0667	85.1379	84.9642	84.1552	84.1552	84.0054	84.4668	84.9642	85.3157	85.6832	(39)
Average = Sum(39)m / 12 =												85.1371	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5924	1.5887	1.5850	1.5679	1.5647	1.5498	1.5498	1.5471	1.5556	1.5647	1.5712	1.5780	(40)
HLP (average)												1.5679	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8168 (42)

Hot water usage for mixer showers												
	54.6816	53.8599	52.6624	50.3713	48.6805	46.7949	45.7232	46.9116	48.2143	50.2388	52.5791	54.4721 (42a)
Hot water usage for baths												
	23.6381	23.2871	22.7927	21.8812	21.1986	20.4418	20.0330	20.5239	21.0584	21.8683	22.7986	23.5582 (42b)
Hot water usage for other uses												
	33.2361	32.0275	30.8189	29.6103	28.4017	27.1931	27.1931	28.4017	29.6103	30.8189	32.0275	33.2361 (42c)
Average daily hot water use (litres/day)												102.5455 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	111.5558	109.1744	106.2740	101.8628	98.2808	94.4299	92.9493	95.8372	98.8830	102.9260	107.4052	111.2664	(44)
Energy conte	176.6771	155.4629	163.3392	139.4450	132.3049	116.1126	112.4142	118.6665	121.9327	139.6695	153.0184	174.2163	(45)
Energy content (annual)										Total = Sum(45)m =		1703.2592	
Distribution loss (46)m = 0.15 x (45)m													
	26.5016	23.3194	24.5009	20.9168	19.8457	17.4169	16.8621	17.8000	18.2899	20.9504	22.9528	26.1324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	223.2720	197.5486	209.9341	184.5369	178.8998	161.2044	159.0091	165.2614	167.0245	186.2644	198.1102	220.8112	(62)
WWHRS	-24.9982	-22.1086	-23.1508	-19.1698	-17.8656	-15.2877	-14.3298	-15.2383	-15.8172	-18.6468	-21.1245	-24.5352	(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													
	198.2739	175.4401	186.7833	165.3671	161.0343	145.9167	144.6793	150.0231	151.2073	167.6177	176.9857	196.2760	(64)
										Total per year (kWh/year) = Sum(64)m =		2019.6042	(64)
12Total per year (kWh/year)												2020	(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													
	96.0211	85.3600	91.5862	82.4389	81.2673	74.6809	74.6536	76.7325	76.6161	83.7160	86.9521	95.2028	(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	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	80.9187	89.5886	80.9187	83.6160	80.9187	83.6160	80.9187	80.9187	83.6160	80.9187	83.6160	80.9187	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	158.3798	160.0233	155.8818	147.0649	135.9353	125.4749	118.4868	116.8433	120.9848	129.8017	140.9314	151.3917	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	(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)													
	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	(71)
Water heating gains (Table 5)													
	129.0606	127.0238	123.0997	114.4985	109.2303	103.7235	100.3409	103.1351	106.4112	112.5216	120.7668	127.9608	(72)
Total internal gains													

	421.6114	429.8880	413.1525	398.4318	379.3365	363.0667	349.9987	351.1495	361.2644	376.4943	398.5664	413.5235 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.1400	10.6334	0.6300	0.7000	0.7700	10.2041	(74)
East	3.2000	19.6403	0.6300	0.7000	0.7700	19.2074	(76)
South	4.0000	46.7521	0.6300	0.7000	0.7700	57.1522	(78)

Solar gains	86.5636	150.6748	214.2452	278.2277	322.7238	325.1144	311.4901	277.6721	236.3581	168.7542	104.2822	73.6866	(83)
Total gains	508.1751	580.5628	627.3977	676.6595	702.0603	688.1811	661.4888	628.8216	597.6225	545.2485	502.8487	487.2101	(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	48.0747	48.1871	48.2978	48.8247	48.9246	49.3948	49.3948	49.4829	49.2126	48.9246	48.7230	48.5140	
alpha	4.2050	4.2125	4.2199	4.2550	4.2616	4.2930	4.2930	4.2989	4.2808	4.2616	4.2482	4.2343	
util living area	0.9919	0.9851	0.9719	0.9355	0.8545	0.7009	0.5384	0.5829	0.8003	0.9469	0.9848	0.9932	(86)
MIT	19.4025	19.6106	19.9140	20.3224	20.6753	20.9037	20.9758	20.9660	20.8213	20.3729	19.8221	19.3722	(87)
Th 2	19.6189	19.6217	19.6243	19.6369	19.6393	19.6503	19.6503	19.6524	19.6461	19.6393	19.6345	19.6295	(88)
util rest of house	0.9890	0.9796	0.9610	0.9090	0.7934	0.5852	0.3840	0.4276	0.7013	0.9193	0.9781	0.9907	(89)
MIT 2	17.8261	18.0913	18.4744	18.9823	19.3819	19.6014	19.6444	19.6428	19.5379	19.0550	18.3707	17.7948	(90)
Living area fraction									fLA = Living area / (4) =			0.4273	(91)
MIT	18.4996	18.7405	19.0895	19.5549	19.9345	20.1579	20.2132	20.2082	20.0862	19.6181	18.9908	18.4687	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4996	18.7405	19.0895	19.5549	19.9345	20.1579	20.2132	20.2082	20.0862	19.6181	18.9908	18.4687	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9855	0.9748	0.9555	0.9071	0.8085	0.6320	0.4507	0.4947	0.7375	0.9188	0.9738	0.9877	(94)
Useful gains	500.8054	565.9148	599.4568	613.7951	567.6447	434.9249	298.1327	311.0580	440.7341	500.9679	489.6558	481.2036	(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	1227.7881	1193.9406	1083.5375	907.1335	699.6355	467.7233	304.0715	319.9064	505.6373	766.2138	1014.4746	1222.5898	(97)
Space heating kWh	540.8751	422.0333	360.1561	211.2036	98.2011	0.0000	0.0000	0.0000	0.0000	197.3429	377.8695	551.5913	(98a)
Space heating requirement - total per year (kWh/year)												2759.2730	
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	540.8751	422.0333	360.1561	211.2036	98.2011	0.0000	0.0000	0.0000	0.0000	197.3429	377.8695	551.5913	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2759.2730	
Space heating per m2										(98c) / (4) =		50.8153	(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	540.8751	422.0333	360.1561	211.2036	98.2011	0.0000	0.0000	0.0000	0.0000	197.3429	377.8695	551.5913	(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)	585.9968	457.2409	390.2016	228.8230	106.3934	0.0000	0.0000	0.0000	0.0000	213.8060	409.3927	597.6070	(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	198.2739	175.4401	186.7833	165.3671	161.0343	145.9167	144.6793	150.0231	151.2073	167.6177	176.9857	196.2760	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.1924	85.9535	85.5066	84.6095	82.9861	79.8000	79.8000	79.8000	79.8000	84.4269	85.7164	86.2471	(217)
Fuel for water heating, kWh/month	230.0364	204.1105	218.4430	195.4473	194.0497	182.8530	181.3024	187.9989	189.4828	198.5360	206.4782	227.5739	(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	16.8133	13.4883	12.1447	8.8977	6.8729	5.6152	6.2696	8.1495	10.5854	13.8886	15.6872	17.2806	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.6464	-27.2298	-40.5371	-47.2765	-52.4789	-49.5590	-48.9787	-45.5094	-39.6208	-31.9129	-20.8408	-16.0147	(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	-7.8556	-16.7721	-33.7885	-51.4052	-68.5982	-69.1287	-68.2892	-57.5119	-41.7674	-24.1731	-10.5510	-6.1918	(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	2989.4615	(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	2416.3120	(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)	135.6930	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-894.6378	(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	4732.8287	(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	2989.4615	0.2100	627.7869	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2416.3120	0.2100	507.4255	(264)
Space and water heating			1135.2124	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.6930	0.1443	19.5847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-438.6052	0.1338	-58.6981	
PV Unit electricity exported	-456.0326	0.1255	-57.2456	
Total			-115.9437	(269)
Total CO2, kg/year			1050.7827	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			19.3500	(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	2989.4615	1.1300	3378.0915	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2416.3120	1.1300	2730.4326	(278)
Space and water heating			6108.5241	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.6930	1.5338	208.1305	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-438.6052	1.4946	-655.5246	
PV Unit electricity exported	-456.0326	0.4608	-210.1232	
Total			-865.6479	(283)
Total Primary energy kWh/year			5581.1075	(286)
Target Primary Energy Rate (TPER)			102.7800	(287)

Summary for Input Data

elmhurst energy

Property Reference	4-M-N Gas	**Issued on Date**	05/02/2024
Assessment Reference	4-M-N Gas	**Prop Type Ref**	4-M-N Gas
Property			

SAP Rating	85 B	**DER**	12.14	**TER**	14.18
Environmental	90 B	**% DER < TER**			14.39
CO_2 Emissions (t/year)	0.83	**DFEE**	36.75	**TFEE**	42.64
Compliance Check	See BREL	**% DFEE < TFEE**			13.81
% DPER < TPER	5.96	**DPER**	70.34	**TPER**	74.80

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Mid-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	25.00 m	73.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	30.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	29.00	27.80	0.00	None	1.20	Enter Gross Area
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	29.00	21.00	0.00	None	8.00	Enter Gross Area
East	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	18.00	14.00	0.00	None	4.00	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	28.00	25.80	2.50	Stairwell Stairwell 2	2.20	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	10.00	0.00	None

Summary for Input Data

elmhurst energy

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	87.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling	Concrete floor slab, carpeted	100.00	73.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Exposed Floor - Solid	Lowest occupied	Other	0.11	Garage Single 1 Inside	0.70	0.00	23.00

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Concrete floor slab, carpeted	100.00	50.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
North	Window	North	North	1.20	0
East	Window	East	East	4.00	0
South	Window	South	South	8.00	0
Opening	Door	Wall to Common	North	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	9.30	0.05	0.05	No
E3 Sill	Independently assessed	7.30	0.05	0.05	No
E4 Jamb	Independently assessed	16.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	12.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	120.00	0.07	0.07	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	6.00	0.02	0.02	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Independently assessed	15.00	0.00	0.00	No

Y-value	0.11	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00
Wet Rooms	1

Summary for Input Data

SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	Manufacturer	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	102	
In Winter	88.80	
In Summer	79.80	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2106	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes

Summary for Input Data

Summer Immersion	No	
Cold Water Source	From header tank	
Bath Count	1	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	4-M-N Gas	**Issued on Date**	05/02/2024
Assessment Reference	4-M-N Gas	**Prop Type Ref**	4-M-N Gas
Property			

SAP Rating	85 B	**DER**	12.14	**TER**	14.18
Environmental	90 B	**% DER < TER**			14.39
CO_2 Emissions (t/year)	0.83	**DFEE**	36.75	**TFEE**	42.64
Compliance Check	See BREL	**% DFEE < TFEE**			13.81
% DPER < TPER	5.96	**DPER**	70.34	**TPER**	74.80

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	73.0000 (1b)	x	3.0000 (2b)	=	219.0000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.0000	(5)

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2. Ventilation rate

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			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		0 * 10 =	0.0000	(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) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			1.5000	(17)
Infiltration rate			0.0750	(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) =	0.0694	(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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		86.4000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			13.2000	0.8687	11.4672			(27)
Door			2.2000	1.1000	2.4200			(26)
Heatloss Floor 1			23.0000	0.1021	2.3491			(28b)
North	29.0000	1.2000	27.8000	0.1400	3.8920	110.0000	3058.0000	(29a)
South	29.0000	8.0000	21.0000	0.1400	2.9400	110.0000	2310.0000	(29a)
East	18.0000	4.0000	14.0000	0.1400	1.9600	110.0000	1540.0000	(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1100	2.8380	14.0000	361.2000	(29a)
Total net area of external elements Aum(A, m2)			127.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.8663			(33)
Party Wall 1			10.0000	0.0000	0.0000	70.0000	700.0000	(32)
Party Floor 1			50.0000			80.0000	4000.0000	(32d)
Party Ceiling			73.0000			100.0000	7300.0000	(32b)
Internal Wall 1			87.0000			9.0000	783.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20052.2000 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 274.6877 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	9.3000	0.0500	0.4650
E3	Sill	7.3000	0.0500	0.3650
E4	Jamb	16.0000	0.0500	0.8000
E20	Exposed floor (normal)	12.0000	0.3200	3.8400
E7	Party floor between dwellings (in blocks of flats)	120.0000	0.0700	8.4000
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	15.0000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9900 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.8563 (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	11.3069	11.1815	11.0562	10.4295	10.3041	9.6774	9.6774	9.5521	9.9281	10.3041	10.5548	10.8055	(38)
Heat transfer coeff	53.1632	53.0378	52.9125	52.2858	52.1604	51.5337	51.5337	51.4084	51.7844	52.1604	52.4111	52.6618	(39)
Average = Sum(39)m / 12 =												52.2544	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7283	0.7265	0.7248	0.7162	0.7145	0.7059	0.7059	0.7042	0.7094	0.7145	0.7180	0.7214	(40)
HLP (average)												0.7158	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3167 (42)
Hot water usage for mixer showers

69.1536	68.0948	66.5345	64.1343	61.9837	58.9751	56.5954	59.3774	60.7766	63.7565	66.8598	69.0912	(42a)

Hot water usage for baths

26.6351	26.2331	25.6611	24.8045	24.0325	22.9698	22.1635	23.1494	23.6668	24.7198	25.8146	26.6140	(42b)

Hot water usage for other uses

38.3553	36.9606	35.5658	34.1711	32.7764	31.3816	31.3816	32.7764	34.1711	35.5658	36.9606	38.3553	(42c)

Average daily hot water use (litres/day) 123.3198 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	134.1440	131.2885	127.7615	123.1098	118.7926	113.3265	110.1406	115.3032	118.6145	124.0422	129.6350	134.0605	(44)
Energy conte	197.4832	173.7212	182.5685	160.8122	153.0762	131.0583	121.7086	135.7139	137.5869	159.8409	175.2060	196.8777	(45)
Energy content (annual)										Total = Sum(45)m =		1925.6536	
Distribution loss (46)m = 0.15 x (45)m	29.6225	26.0582	27.3853	24.1218	22.9614	19.6587	18.2563	20.3571	20.6380	23.9761	26.2809	29.5317	(46)
Water storage loss:													
Store volume												150.0000	(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	250.8776	221.9484	235.9629	212.4842	206.4706	182.7303	175.1030	189.1083	189.2589	213.2353	226.8780	250.2721	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	250.8776	221.9484	235.9629	212.4842	206.4706	182.7303	175.1030	189.1083	189.2589	213.2353	226.8780	250.2721	(64)
										Total per year (kWh/year) = Sum(64)m =		2554.3296	(64)
12Total per year (kWh/year)												2554	(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	108.3787	96.3441	103.4195	94.8077	93.6134	84.9145	83.1836	87.8404	87.0852	95.8626	99.5936	108.1774	(65)

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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	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6896	119.2278	107.6896	111.2793	107.6896	111.2793	107.6896	107.6896	111.2793	107.6896	111.2793	107.6896	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.1952	206.3141	200.9745	189.6072	175.2580	161.7717	152.7621	150.6432	155.9828	167.3501	181.6993	195.1856	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	(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)	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	(71)
Water heating gains (Table 5)	145.6703	143.3691	139.0048	131.6773	125.8244	117.9368	111.8059	118.0651	120.9517	128.8476	138.3245	145.3997	(72)
Total internal gains	518.3056	529.6615	508.4194	493.3143	469.5225	448.7383	430.0082	434.1484	445.9643	464.6378	492.0536	509.0254	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2000	10.6334	0.4000	0.7000	0.7700	2.4760	(74)
East	4.0000	19.6403	0.4000	0.7000	0.7700	15.2440	(76)
South	8.0000	46.7521	0.4000	0.7000	0.7700	72.5742	(78)

Solar gains	90.2941	153.4099	208.5541	255.6580	283.4921	280.0864	270.6043	250.1089	224.9432	169.2162	108.0870	77.3108	(83)
Total gains	608.5997	683.0715	716.9735	748.9723	753.0146	728.8247	700.6125	684.2573	670.9075	633.8541	600.1406	586.3361	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	104.7728	105.0204	105.2692	106.5310	106.7870	108.0857	108.0857	108.3492	107.5624	106.7870	106.2762	105.7703	
alpha	7.9849	8.0014	8.0179	8.1021	8.1191	8.2057	8.2057	8.2233	8.1708	8.1191	8.0851	8.0514	
util living area	0.9840	0.9613	0.9168	0.8021	0.6376	0.4522	0.3236	0.3456	0.5311	0.8099	0.9556	0.9874	(86)
MIT	20.5762	20.7106	20.8387	20.9531	20.9927	20.9996	21.0000	21.0000	20.9986	20.9572	20.7722	20.5510	(87)
Th 2	20.3159	20.3174	20.3190	20.3265	20.3280	20.3356	20.3356	20.3371	20.3326	20.3280	20.3250	20.3220	(88)
util rest of house	0.9795	0.9513	0.8976	0.7680	0.5939	0.4054	0.2748	0.2958	0.4804	0.7703	0.9426	0.9837	(89)
MIT 2	19.9414	20.0712	20.1904	20.2939	20.3239	20.3354	20.3356	20.3371	20.3319	20.2999	20.1378	19.9222	(90)
Living area fraction									fLA = Living area / (4) =			0.4110	(91)
MIT	20.2023	20.3339	20.4568	20.5648	20.5988	20.6084	20.6086	20.6095	20.6059	20.5700	20.3985	20.1806	(92)
Temperature adjustment												-0.1500	
adjusted MIT	20.0523	20.1839	20.3068	20.4148	20.4488	20.4584	20.4586	20.4595	20.4559	20.4200	20.2485	20.0306	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9773	0.9491	0.8973	0.7727	0.6019	0.4141	0.2838	0.3050	0.4898	0.7760	0.9410	0.9818	(94)
Useful gains	594.8139	648.3128	643.3157	578.7276	453.2256	301.7760	198.8445	208.6842	328.6372	491.8740	564.7129	575.6665	(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	837.4425	810.6260	730.5521	602.0601	456.3392	301.9039	198.8491	208.6926	329.1361	512.2149	689.1279	833.6692	(97)
Space heating kWh	180.5157	109.0745	64.9038	16.7994	2.3165	0.0000	0.0000	0.0000	0.0000	15.1336	89.5787	191.9541	(98a)
Space heating requirement - total per year (kWh/year)												670.2763	
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	180.5157	109.0745	64.9038	16.7994	2.3165	0.0000	0.0000	0.0000	0.0000	15.1336	89.5787	191.9541	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												670.2763	
Space heating per m2											(98c) / (4) =	9.1819	(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 %) 88.8000 (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	180.5157	109.0745	64.9038	16.7994	2.3165	0.0000	0.0000	0.0000	0.0000	15.1336	89.5787	191.9541	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	203.2834	122.8316	73.0899	18.9183	2.6087	0.0000	0.0000	0.0000	0.0000	17.0423	100.8770	216.1645	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	250.8776	221.9484	235.9629	212.4842	206.4706	182.7303	175.1030	189.1083	189.2589	213.2353	226.8780	250.2721	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.3342	82.5571	81.5837	80.3970	79.8898	79.8000	79.8000	79.8000	79.8000	80.3396	82.1570	83.4722	(217)
Fuel for water heating, kWh/month	301.0498	268.8424	289.2279	264.2937	258.4442	228.9853	219.4273	236.9779	237.1665	265.4174	276.1517	299.8270	(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	26.3654	23.8139	26.3654	25.5149	26.3654	25.5149	26.3654	26.3654	25.5149	26.3654	25.5149	26.3654	(231)
Lighting	20.8208	16.7032	15.0394	11.0185	8.5110	6.9536	7.7640	10.0920	13.1085	17.1990	19.4263	21.3995	(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 1 754.8156 (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 3145.8111 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)

mechanical ventilation fans (SFP = 0.8400) 224.4312 (230a)

central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	310.4312	(231)
Electricity for lighting (calculated in Appendix L)	168.0357	(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	4379.0936	(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	754.8156	0.2100	158.5113	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3145.8111	0.2100	660.6203	(264)
Space and water heating			819.1316	(265)
Pumps, fans and electric keep-hot	310.4312	0.1387	43.0606	(267)
Energy for lighting	168.0357	0.1443	24.2527	(268)
Total CO2, kg/year			886.4450	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.1400	(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	754.8156	1.1300	852.9417	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3145.8111	1.1300	3554.7665	(278)
Space and water heating			4407.7082	(279)
Pumps, fans and electric keep-hot	310.4312	1.5128	469.6203	(281)
Energy for lighting	168.0357	1.5338	257.7387	(282)
Total Primary energy kWh/year			5135.0672	(286)
Dwelling Primary energy Rate (DPER)			70.3400	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		73.0000 (1b)	x	3.0000 (2b)	=	219.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.1370	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3870	(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) =	0.3580	(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	0.4564	0.4475	0.4385	0.3938	0.3848	0.3401	0.3401	0.3311	0.3580	0.3848	0.4027	0.4206	(22b)
Effective ac	0.6042	0.6001	0.5961	0.5775	0.5740	0.5578	0.5578	0.5548	0.5641	0.5740	0.5811	0.5885	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			13.2000	1.1450	15.1145			(27)
Heatloss Floor 1			23.0000	0.1300	2.9900			(28b)
North	29.0000	1.2000	27.8000	0.1800	5.0040			(29a)
South	29.0000	8.0000	21.0000	0.1800	3.7800			(29a)
East	18.0000	4.0000	14.0000	0.1800	2.5200			(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1800	4.6440			(29a)
Total net area of external elements Aum(A, m2)			127.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.2525			(33)
Party Wall 1			10.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 254.6877 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	9.3000	0.0500	0.4650
E3 Sill	7.3000	0.0500	0.3650
E4 Jamb	16.0000	0.0500	0.8000
E20 Exposed floor (normal)	12.0000	0.3200	3.8400
E7 Party floor between dwellings (in blocks of flats)	120.0000	0.0700	8.4000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.0000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9900 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.2425 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.6620	43.3697	43.0832	41.7376	41.4858	40.3138	40.3138	40.0967	40.7652	41.4858	41.9951	42.5276	(38)
Heat transfer coeff	93.9045	93.6122	93.3257	91.9801	91.7283	90.5563	90.5563	90.3392	91.0077	91.7283	92.2376	92.7701	(39)

Average = Sum(39)m / 12 = 91.9789

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2864	1.2824	1.2784	1.2600	1.2566	1.2405	1.2405	1.2375	1.2467	1.2566	1.2635	1.2708	(40)
HLP (average)												1.2600	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3167 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	63.0631	62.1154	60.7344	58.0921	56.1421	53.9675	52.7315	54.1021	55.6045	57.9393	60.6384	62.8215	(42a)
Hot water usage for baths	27.2424	26.8378	26.2681	25.2176	24.4310	23.5588	23.0876	23.6534	24.2694	25.2027	26.2748	27.1503	(42b)
Hot water usage for other uses	38.3553	36.9606	35.5658	34.1711	32.7764	31.3816	31.3816	32.7764	34.1711	35.5658	36.9606	38.3553	(42c)

Average daily hot water use (litres/day) 118.2686 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.6609	125.9138	122.5683	117.4808	113.3495	108.9079	107.2008	110.5318	114.0450	118.7078	123.8738	128.3271	(44)
Energy conte	203.7674	179.2996	188.3830	160.8253	152.5902	133.9150	129.6500	136.8615	140.6288	161.0854	176.4809	200.9293	(45)
Energy content (annual)										Total = Sum(45)m =		1964.4164	
Distribution loss (46)m = 0.15 x (45)m	30.5651	26.8949	28.2574	24.1238	22.8885	20.0873	19.4475	20.5292	21.0943	24.1628	26.4721	30.1394	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	250.3623	221.3853	234.9779	205.9171	199.1851	179.0068	176.2449	183.4564	185.7207	207.6803	221.5728	247.5242	(62)
WWHRS	-28.8298	-25.4973	-26.6993	-22.1081	-20.6040	-17.6310	-16.5262	-17.5740	-18.2417	-21.5049	-24.3625	-28.2959	(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	221.5324	195.8880	208.2785	183.8090	178.5811	161.3759	159.7187	165.8824	167.4790	186.1754	197.2103	219.2283	(64)
									Total per year (kWh/year) = Sum(64)m =			2245.1592	(64)
12Total per year (kWh/year)												2245	(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	105.0286	93.2857	99.9133	89.5479	88.0122	80.6002	80.3846	82.7824	82.8326	90.8368	94.7534	104.0849	(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	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	105.1165	116.3790	105.1165	108.6204	105.1165	108.6204	105.1165	105.1165	108.6204	105.1165	108.6204	105.1165	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.1952	206.3141	200.9745	189.6072	175.2580	161.7717	152.7621	150.6432	155.9828	167.3501	181.6993	195.1856	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	(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)	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	(71)
Water heating gains (Table 5)	141.1674	138.8180	134.2920	124.3721	118.2959	111.9447	108.0438	111.2666	115.0452	122.0925	131.6019	139.8991	(72)
Total internal gains	511.2296	522.2616	501.1335	483.3502	459.4209	440.0874	423.6729	424.7768	437.3989	455.3096	482.6721	500.9517	(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	1.2000	10.6334	0.6300	0.7000	0.7700	3.8996	(74)
East	4.0000	19.6403	0.6300	0.7000	0.7700	24.0093	(76)
South	8.0000	46.7521	0.6300	0.7000	0.7700	114.3043	(78)

Solar gains	142.2132	241.6207	328.4727	402.6613	446.5001	441.1361	426.2018	393.9215	354.2855	266.5156	170.2371	121.7644	(83)
Total gains	653.4429	763.8823	829.6063	886.0115	905.9210	881.2235	849.8747	818.6983	791.6844	721.8252	652.9092	622.7161	(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	54.9974	55.1691	55.3384	56.1480	56.3021	57.0308	57.0308	57.1678	56.7479	56.3021	55.9912	55.6699	
alpha	4.6665	4.6779	4.6892	4.7432	4.7535	4.8021	4.8021	4.8112	4.7832	4.7535	4.7327	4.7113	
util living area	0.9901	0.9790	0.9584	0.9053	0.8005	0.6247	0.4622	0.4978	0.7198	0.9191	0.9794	0.9920	(86)
MIT	19.6988	19.9268	20.2106	20.5589	20.8184	20.9586	20.9920	20.9886	20.9174	20.5875	20.0887	19.6675	(87)
Th 2	19.8515	19.8547	19.8578	19.8723	19.8750	19.8877	19.8877	19.8901	19.8828	19.8750	19.8695	19.8638	(88)
util rest of house	0.9869	0.9724	0.9450	0.8750	0.7402	0.5297	0.3488	0.3827	0.6299	0.8865	0.9717	0.9894	(89)
MIT 2	18.3736	18.6628	19.0181	19.4463	19.7305	19.8657	19.8854	19.8865	19.8324	19.4909	18.8807	18.3426	(90)
Living area fraction										fLA = Living area / (4) =		0.4110	(91)
MIT	18.9182	19.1823	19.5082	19.9035	20.1776	20.3149	20.3402	20.3394	20.2783	19.9415	19.3772	18.8871	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9182	19.1823	19.5082	19.9035	20.1776	20.3149	20.3402	20.3394	20.2783	19.9415	19.3772	18.8871	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9833	0.9674	0.9400	0.8759	0.7578	0.5676	0.3956	0.4302	0.6637	0.8888	0.9674	0.9863	(94)
Useful gains	642.5613	738.9712	779.8373	776.0996	686.4801	500.1467	336.2278	352.2004	525.4756	641.5627	631.5946	614.1664	(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	1372.7141	1336.9950	1213.9991	1012.1040	777.6341	517.5167	338.6966	355.8840	562.2723	856.8818	1132.4157	1362.5216	(97)
Space heating kWh	543.2337	401.8720	323.0164	169.9232	67.8186	0.0000	0.0000	0.0000	0.0000	160.1974	360.5913	556.7763	(98a)
Space heating requirement - total per year (kWh/year)												2583.4288	
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	543.2337	401.8720	323.0164	169.9232	67.8186	0.0000	0.0000	0.0000	0.0000	160.1974	360.5913	556.7763	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2583.4288	
Space heating per m2											(98c) / (4) =	35.3894	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	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	543.2337	401.8720	323.0164	169.9232	67.8186	0.0000	0.0000	0.0000	0.0000	160.1974	360.5913	556.7763	(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)	588.5523	435.3976	349.9636	184.0988	73.4762	0.0000	0.0000	0.0000	0.0000	173.5616	390.6731	603.2246	(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	221.5324	195.8880	208.2785	183.8090	178.5811	161.3759	159.7187	165.8824	167.4790	186.1754	197.2103	219.2283	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9907	85.6350	85.0401	83.8840	82.0900	79.8000	79.8000	79.8000	79.8000	83.7246	85.3950	86.0580	(217)
Fuel for water heating, kWh/month	257.6238	228.7475	244.9179	219.1229	217.5432	202.2254	200.1488	207.8727	209.8735	222.3665	230.9390	254.7447	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.8411	17.5218	15.7764	11.5585	8.9281	7.2943	8.1445	10.5865	13.7509	18.0419	20.3783	22.4482	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.7884	-36.0506	-53.4389	-62.0272	-68.5673	-64.6141	-63.8240	-59.4246	-51.9411	-42.0895	-27.6422	-21.3042	(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	-10.8404	-23.1048	-46.4833	-70.6389	-94.2068	-94.9476	-93.8289	-79.0754	-57.4758	-33.3116	-14.5605	-8.5499	(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	2798.9478	(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	2696.1259	(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)	176.2705	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1202.7360	(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	4554.6082	(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	2798.9478	0.2100	587.7790	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2696.1259	0.2100	566.1864	(264)
Space and water heating			1153.9655	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	176.2705	0.1443	25.4413	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-575.7123	0.1339	-77.1068	
PV Unit electricity exported	-627.0237	0.1256	-78.7247	
Total			-155.8315	(269)
Total CO2, kg/year			1035.5045	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.1800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2798.9478	1.1300	3162.8110	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2696.1259	1.1300	3046.6222	(278)
Space and water heating			6209.4333	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	176.2705	1.5338	270.3695	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-575.7123	1.4950	-860.6647	
PV Unit electricity exported	-627.0237	0.4608	-288.9637	
Total			-1149.6284	(283)
Total Primary energy kWh/year			5460.2752	(286)
Target Primary Energy Rate (TPER)			74.8000	(287)

Summary for Input Data

elmhurst energy

Property Reference	4-T-N Gas	**Issued on Date**	05/02/2024
Assessment Reference	4-T-N Gas	**Prop Type Ref**	4-T-N Gas
Property			

SAP Rating	83 B	**DER**	14.77	**TER**	16.51
Environmental	88 B	**% DER < TER**			10.54
CO_2 Emissions (t/year)	0.99	**DFEE**	48.34	**TFEE**	53.21
Compliance Check	See BREL	**% DFEE < TFEE**			9.15
% DPER < TPER	3.23	**DPER**	84.49	**TPER**	87.31

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Top-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	25.00 m	73.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	30.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	29.00	27.80	0.00	None	1.20	Enter Gross Area
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	29.00	21.00	0.00	None	8.00	Enter Gross Area
East	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	18.00	14.00	0.00	None	4.00	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	28.00	25.80	2.50	Stairwell Stairwell 2	2.20	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	10.00	0.00	None

Summary for Input Data

elmhurst energy

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	87.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	73.00	73.00	None	0.00	Enter Gross Area	0.00

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Concrete floor slab, carpeted	100.00	73.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
North	Window	North	North	1.20	0
East	Window	East	East	4.00	0
South	Window	South	South	8.00	0
Opening	Door	Wall to Common	North	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	9.30	0.05	0.05	No
E3 Sill	Independently assessed	7.30	0.05	0.05	No
E4 Jamb	Independently assessed	16.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	12.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	60.00	0.07	0.07	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	6.00	0.02	0.02	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Independently assessed	15.00	0.00	0.00	No
E15 Flat roof with parapet	Independently assessed	25.00	0.56	0.56	No

Y-value	0.13	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)

Summary for Input Data

elmhurst energy

Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	Manufacturer	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	102	
In Winter	88.80	
In Summer	79.80	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2106	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	

25.0 Main Heating 2	None

26.0 Heat Networks	None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From header tank

Summary for Input Data

Bath Count	1	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	4-T-N Gas	**Issued on Date**	05/02/2024
Assessment Reference	4-T-N Gas	**Prop Type Ref**	4-T-N Gas
Property			

SAP Rating	83 B	**DER**	14.77	**TER**	16.51
Environmental	88 B	**% DER < TER**			10.54
CO_2 Emissions (t/year)	0.99	**DFEE**	48.34	**TFEE**	53.21
Compliance Check	See BREL	**% DFEE < TFEE**			9.15
% DPER < TPER	3.23	**DPER**	84.49	**TPER**	87.31

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
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	73.0000	(1b)	x 3.0000	(2b) =	219.0000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		219.0000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (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) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		1.5000 (17)
Infiltration rate		0.0750 (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) =	0.0694 (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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	86.4000 (23c)

Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(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	
Window (Uw = 0.90)			13.2000	0.8687	11.4672			(27)
Door			2.2000	1.1000	2.4200			(26)
North	29.0000	1.2000	27.8000	0.1400	3.8920	110.0000	3058.0000	(29a)
South	29.0000	8.0000	21.0000	0.1400	2.9400	110.0000	2310.0000	(29a)
East	18.0000	4.0000	14.0000	0.1400	1.9600	110.0000	1540.0000	(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1100	2.8380	14.0000	361.2000	(29a)
External Roof 1	73.0000		73.0000	0.1100	8.0300	9.0000	657.0000	(30)
Total net area of external elements Aum(A, m2)			177.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.5472			(33)
Party Wall 1			10.0000	0.0000	0.0000	70.0000	700.0000	(32)
Party Floor 1			73.0000			80.0000	5840.0000	(32d)
Internal Wall 1			87.0000			9.0000	783.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15249.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		208.8932 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	9.3000	0.0500	0.4650
E3 Sill	7.3000	0.0500	0.3650
E4 Jamb	16.0000	0.0500	0.8000
E20 Exposed floor (normal)	12.0000	0.3200	3.8400
E7 Party floor between dwellings (in blocks of flats)	60.0000	0.0700	4.2000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.0000	0.0000	0.0000
E15 Flat roof with parapet	25.0000	0.5600	14.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 23.7900 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 57.3372 (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	11.3069	11.1815	11.0562	10.4295	10.3041	9.6774	9.6774	9.5521	9.9281	10.3041	10.5548	10.8055	(38)
Heat transfer coeff	68.6440	68.5187	68.3934	67.7666	67.6413	67.0146	67.0146	66.8892	67.2653	67.6413	67.8920	68.1427	(39)
Average = Sum(39)m / 12 =												67.7353	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9403	0.9386	0.9369	0.9283	0.9266	0.9180	0.9180	0.9163	0.9214	0.9266	0.9300	0.9335	(40)
HLP (average)												0.9279	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3167 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	69.1536	68.0948	66.5345	64.1343	61.9837	58.9751	56.5954	59.3774	60.7766	63.7565	66.8598	69.0912	(42a)
Hot water usage for baths	26.6351	26.2331	25.6611	24.8045	24.0325	22.9698	22.1635	23.1494	23.6668	24.7198	25.8146	26.6140	(42b)
Hot water usage for other uses	38.3553	36.9606	35.5658	34.1711	32.7764	31.3816	31.3816	32.7764	34.1711	35.5658	36.9606	38.3553	(42c)
Average daily hot water use (litres/day)												123.3198	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	134.1440	131.2885	127.7615	123.1098	118.7926	113.3265	110.1406	115.3032	118.6145	124.0422	129.6350	134.0605	(44)
Energy conte	197.4832	173.7212	182.5685	160.8122	153.0762	131.0583	121.7086	135.7139	137.5869	159.8409	175.2060	196.8777	(45)
Energy content (annual)											Total = Sum(45)m =	1925.6536	
Distribution loss (46)m = 0.15 x (45)m	29.6225	26.0582	27.3853	24.1218	22.9614	19.6587	18.2563	20.3571	20.6380	23.9761	26.2809	29.5317	(46)
Water storage loss:													
Store volume												150.0000	(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	250.8776	221.9484	235.9629	212.4842	206.4706	182.7303	175.1030	189.1083	189.2589	213.2353	226.8780	250.2721	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	250.8776	221.9484	235.9629	212.4842	206.4706	182.7303	175.1030	189.1083	189.2589	213.2353	226.8780	250.2721	(64)
										Total per year (kWh/year) = Sum(64)m =		2554.3296	(64)
12Total per year (kWh/year)												2554	(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	108.3787	96.3441	103.4195	94.8077	93.6134	84.9145	83.1836	87.8404	87.0852	95.8626	99.5936	108.1774	(65)

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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	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6896	119.2278	107.6896	111.2793	107.6896	111.2793	107.6896	107.6896	111.2793	107.6896	111.2793	107.6896	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.1952	206.3141	200.9745	189.6072	175.2580	161.7717	152.7621	150.6432	155.9828	167.3501	181.6993	195.1856	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	(71)
Water heating gains (Table 5)	145.6703	143.3691	139.0048	131.6773	125.8244	117.9368	111.8059	118.0651	120.9517	128.8476	138.3245	145.3997	(72)
Total internal gains	518.3056	529.6615	508.4194	493.3143	469.5225	448.7383	430.0082	434.1484	445.9643	464.6378	492.0536	509.0254	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2000	10.6334	0.4000	0.7000	0.7700	2.4760	(74)
East	4.0000	19.6403	0.4000	0.7000	0.7700	15.2440	(76)
South	8.0000	46.7521	0.4000	0.7000	0.7700	72.5742	(78)

Solar gains	90.2941	153.4099	208.5541	255.6580	283.4921	280.0864	270.6043	250.1089	224.9432	169.2162	108.0870	77.3108	(83)
Total gains	608.5997	683.0715	716.9735	748.9723	753.0146	728.8247	700.6125	684.2573	670.9075	633.8541	600.1406	586.3361	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.7080	61.8209	61.9342	62.5070	62.6228	63.2085	63.2085	63.3269	62.9729	62.6228	62.3916	62.1621	
alpha	5.1139	5.1214	5.1289	5.1671	5.1749	5.2139	5.2139	5.2218	5.1982	5.1749	5.1594	5.1441	
util living area	0.9812	0.9655	0.9392	0.8733	0.7545	0.5726	0.4182	0.4458	0.6568	0.8784	0.9625	0.9841	(86)
MIT	20.0305	20.2165	20.4376	20.7063	20.8922	20.9795	20.9967	20.9953	20.9584	20.7402	20.3523	19.9962	(87)
Th 2	20.1334	20.1348	20.1363	20.1435	20.1450	20.1522	20.1522	20.1537	20.1493	20.1450	20.1421	20.1392	(88)
util rest of house	0.9766	0.9574	0.9250	0.8450	0.7050	0.5029	0.3390	0.3657	0.5879	0.8457	0.9523	0.9802	(89)
MIT 2	19.2640	19.4463	19.6603	19.9150	20.0735	20.1424	20.1512	20.1522	20.1272	19.9509	19.5866	19.2350	(90)
Living area fraction										fLA = Living area / (4) =		0.4110	(91)
MIT	19.5790	19.7628	19.9797	20.2402	20.4100	20.4864	20.4987	20.4987	20.4688	20.2753	19.9013	19.5478	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4290	19.6128	19.8297	20.0902	20.2600	20.3364	20.3487	20.3487	20.3188	20.1253	19.7513	19.3978	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9720	0.9516	0.9192	0.8430	0.7121	0.5184	0.3575	0.3844	0.6022	0.8448	0.9468	0.9760	(94)
Useful gains	591.5644	650.0166	659.0228	631.3860	536.2128	377.8308	250.4466	262.9959	404.0320	535.4956	568.1910	572.2766	(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	1038.5138	1008.1023	911.6657	758.3237	579.0081	384.4224	251.2149	264.1241	418.3097	644.3020	858.9205	1035.6211	(97)
Space heating kWh	332.5303	240.6336	187.9663	91.3952	31.8397	0.0000	0.0000	0.0000	0.0000	80.9520	209.3252	344.7283	(98a)
Space heating requirement - total per year (kWh/year)												1519.3706	
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	332.5303	240.6336	187.9663	91.3952	31.8397	0.0000	0.0000	0.0000	0.0000	80.9520	209.3252	344.7283	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1519.3706	
Space heating per m2										(98c) / (4) =		20.8133	(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 %)												88.8000	(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	332.5303	240.6336	187.9663	91.3952	31.8397	0.0000	0.0000	0.0000	0.0000	80.9520	209.3252	344.7283	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	374.4711	270.9838	211.6738	102.9225	35.8555	0.0000	0.0000	0.0000	0.0000	91.1621	235.7266	388.2075	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	250.8776	221.9484	235.9629	212.4842	206.4706	182.7303	175.1030	189.1083	189.2589	213.2353	226.8780	250.2721	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.6925	84.2414	83.5548	82.3090	80.8954	79.8000	79.8000	79.8000	79.8000	82.0894	83.8796	84.7782	(217)
Fuel for water heating, kWh/month	296.2216	263.4670	282.4049	258.1544	255.2316	228.9853	219.4273	236.9779	237.1665	259.7598	270.4806	295.2081	(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	26.3654	23.8139	26.3654	25.5149	26.3654	25.5149	26.3654	26.3654	25.5149	26.3654	25.5149	26.3654	(231)
Lighting	20.8208	16.7032	15.0394	11.0185	8.5110	6.9536	7.7640	10.0920	13.1085	17.1990	19.4263	21.3995	(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	1711.0030	(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	3103.4849	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)

mechanical ventilation fans (SFP = 0.8400) 224.4312 (230a)

central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	310.4312	(231)
Electricity for lighting (calculated in Appendix L)	168.0357	(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	5292.9548	(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	1711.0030	0.2100	359.3106	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3103.4849	0.2100	651.7318	(264)
Space and water heating			1011.0425	(265)
Pumps, fans and electric keep-hot	310.4312	0.1387	43.0606	(267)
Energy for lighting	168.0357	0.1443	24.2527	(268)
Total CO2, kg/year			1078.3558	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.7700	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1711.0030	1.1300	1933.4333	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3103.4849	1.1300	3506.9380	(278)
Space and water heating			5440.3713	(279)
Pumps, fans and electric keep-hot	310.4312	1.5128	469.6203	(281)
Energy for lighting	168.0357	1.5338	257.7387	(282)
Total Primary energy kWh/year			6167.7304	(286)
Dwelling Primary energy Rate (DPER)			84.4900	(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		73.0000 (1b)	x	3.0000 (2b)	=	219.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.1370	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3870	(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) =	0.3580	(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	0.4564	0.4475	0.4385	0.3938	0.3848	0.3401	0.3401	0.3311	0.3580	0.3848	0.4027	0.4206	(22b)
Effective ac	0.6042	0.6001	0.5961	0.5775	0.5740	0.5578	0.5578	0.5548	0.5641	0.5740	0.5811	0.5885	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			13.2000	1.1450	15.1145			(27)
North	29.0000	1.2000	27.8000	0.1800	5.0040			(29a)
South	29.0000	8.0000	21.0000	0.1800	3.7800			(29a)
East	18.0000	4.0000	14.0000	0.1800	2.5200			(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1800	4.6440			(29a)
External Roof 1	73.0000		73.0000	0.1100	8.0300			(30)
Total net area of external elements Aum(A, m2)			177.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.2925			(33)
Party Wall 1			10.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.8932 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	9.3000	0.0500	0.4650
E3 Sill	7.3000	0.0500	0.3650
E4 Jamb	16.0000	0.0500	0.8000
E20 Exposed floor (normal)	12.0000	0.3200	3.8400
E7 Party floor between dwellings (in blocks of flats)	60.0000	0.0700	4.2000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.0000	0.0000	0.0000
E15 Flat roof with parapet	25.0000	0.5600	14.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 23.7900 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 65.0825 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.6620	43.3697	43.0832	41.7376	41.4858	40.3138	40.3138	40.0967	40.7652	41.4858	41.9951	42.5276	(38)
Heat transfer coeff	108.7445	108.4522	108.1657	106.8201	106.5683	105.3963	105.3963	105.1792	105.8477	106.5683	107.0776	107.6101	(39)
Average = Sum(39)m / 12 =												106.8189	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4897	1.4856	1.4817	1.4633	1.4598	1.4438	1.4438	1.4408	1.4500	1.4598	1.4668	1.4741	(40)
HLP (average)												1.4633	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3167 (42)

Hot water usage for mixer showers

63.0631	62.1154	60.7344	58.0921	56.1421	53.9675	52.7315	54.1021	55.6045	57.9393	60.6384	62.8215	(42a)

Hot water usage for baths

27.2424	26.8378	26.2681	25.2176	24.4310	23.5588	23.0876	23.6534	24.2694	25.2027	26.2748	27.1503	(42b)

Hot water usage for other uses

38.3553	36.9606	35.5658	34.1711	32.7764	31.3816	31.3816	32.7764	34.1711	35.5658	36.9606	38.3553	(42c)

Average daily hot water use (litres/day) 118.2686 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.6609	125.9138	122.5683	117.4808	113.3495	108.9079	107.2008	110.5318	114.0450	118.7078	123.8738	128.3271	(44)
Energy conte	203.7674	179.2996	188.3830	160.8253	152.5902	133.9150	129.6500	136.8615	140.6288	161.0854	176.4809	200.9293	(45)
Energy content (annual)										Total = Sum(45)m =		1964.4164	
Distribution loss (46)m = 0.15 x (45)m	30.5651	26.8949	28.2574	24.1238	22.8885	20.0873	19.4475	20.5292	21.0943	24.1628	26.4721	30.1394	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	250.3623	221.3853	234.9779	205.9171	199.1851	179.0068	176.2449	183.4564	185.7207	207.6803	221.5728	247.5242	(62)
WWHRS	-28.8298	-25.4973	-26.6993	-22.1081	-20.6040	-17.6310	-16.5262	-17.5740	-18.2417	-21.5049	-24.3625	-28.2959	(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	221.5324	195.8880	208.2785	183.8090	178.5811	161.3759	159.7187	165.8824	167.4790	186.1754	197.2103	219.2283	(64)
										Total per year (kWh/year) = Sum(64)m =		2245.1592	(64)
12Total per year (kWh/year)												2245	(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	105.0286	93.2857	99.9133	89.5479	88.0122	80.6002	80.3846	82.7824	82.8326	90.8368	94.7534	104.0849	(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	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	105.1165	116.3790	105.1165	108.6204	105.1165	108.6204	105.1165	105.1165	108.6204	105.1165	108.6204	105.1165	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.1952	206.3141	200.9745	189.6072	175.2580	161.7717	152.7621	150.6432	155.9828	167.3501	181.6993	195.1856	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	(71)
Water heating gains (Table 5)	141.1674	138.8180	134.2920	124.3721	118.2959	111.9447	108.0438	111.2666	115.0452	122.0925	131.6019	139.8991	(72)
Total internal gains	511.2296	522.2616	501.1335	483.3502	459.4209	440.0874	423.6729	424.7768	437.3989	455.3096	482.6721	500.9517	(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	1.2000	10.6334	0.6300	0.7000	0.7700	3.8996	(74)
East	4.0000	19.6403	0.6300	0.7000	0.7700	24.0093	(76)
South	8.0000	46.7521	0.6300	0.7000	0.7700	114.3043	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	142.2132	241.6207	328.4727	402.6613	446.5001	441.1361	426.2018	393.9215	354.2855	266.5156	170.2371	121.7644	(83)
Total gains	653.4429	763.8823	829.6063	886.0115	905.9210	881.2235	849.8747	818.6983	791.6844	721.8252	652.9092	622.7161	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	38.9527	39.0576	39.1611	39.6544	39.7481	40.1901	40.1901	40.2730	40.0187	39.7481	39.5590	39.3633	
alpha	3.5968	3.6038	3.6107	3.6436	3.6499	3.6793	3.6793	3.6849	3.6679	3.6499	3.6373	3.6242	
util living area	0.9836	0.9708	0.9501	0.9039	0.8187	0.6714	0.5173	0.5529	0.7530	0.9156	0.9713	0.9861	(86)
MIT	19.1512	19.4158	19.7687	20.2213	20.6047	20.8682	20.9617	20.9505	20.7869	20.2908	19.6480	19.1131	(87)
Th 2	19.6953	19.6983	19.7012	19.7151	19.7178	19.7299	19.7299	19.7322	19.7252	19.7178	19.7125	19.7070	(88)
util rest of house	0.9790	0.9627	0.9358	0.8749	0.7614	0.5698	0.3808	0.4171	0.6629	0.8840	0.9620	0.9822	(89)
MIT 2	17.6037	17.9387	18.3816	18.9425	19.3828	19.6513	19.7171	19.7139	19.5814	19.0393	18.2451	17.5630	(90)
Living area fraction									fLA = Living area / (4) =			0.4110	(91)
MIT	18.2396	18.5457	18.9516	19.4680	19.8850	20.1514	20.2286	20.2221	20.0768	19.5536	18.8216	18.2000	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2396	18.5457	18.9516	19.4680	19.8850	20.1514	20.2286	20.2221	20.0768	19.5536	18.8216	18.2000	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9718	0.9531	0.9252	0.8682	0.7698	0.6060	0.4366	0.4722	0.6904	0.8790	0.9532	0.9757	(94)
Useful gains	635.0365	728.0847	767.5808	769.2468	697.4123	534.0036	371.0246	386.5679	546.6003	634.4930	622.3579	607.5994	(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	1515.8573	1479.9091	1346.8410	1128.8791	872.2602	585.0931	382.4386	402.0019	632.6307	954.1718	1255.1243	1506.5466	(97)
Space heating kWh	655.3306	505.2260	430.9696	258.9353	130.0868	0.0000	0.0000	0.0000	0.0000	237.8411	455.5918	668.8167	(98a)
Space heating requirement - total per year (kWh/year)												3342.7978	
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	655.3306	505.2260	430.9696	258.9353	130.0868	0.0000	0.0000	0.0000	0.0000	237.8411	455.5918	668.8167	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3342.7978	
Space heating per m2											(98c) / (4) =	45.7918	(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	655.3306	505.2260	430.9696	258.9353	130.0868	0.0000	0.0000	0.0000	0.0000	237.8411	455.5918	668.8167	(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)	710.0007	547.3738	466.9226	280.5366	140.9391	0.0000	0.0000	0.0000	0.0000	257.6826	493.5989	724.6118	(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	221.5324	195.8880	208.2785	183.8090	178.5811	161.3759	159.7187	165.8824	167.4790	186.1754	197.2103	219.2283	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3399	86.0873	85.6526	84.8281	83.3607	79.8000	79.8000	79.8000	79.8000	84.6101	85.8742	86.3946	(217)
Fuel for water heating, kWh/month	256.5818	227.5457	243.1667	216.6840	214.2270	202.2254	200.1488	207.8727	209.8735	220.0392	229.6503	253.7523	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.8411	17.5218	15.7764	11.5585	8.9281	7.2943	8.1445	10.5865	13.7509	18.0419	20.3783	22.4482	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.7884	-36.0506	-53.4389	-62.0272	-68.5673	-64.6141	-63.8240	-59.4246	-51.9411	-42.0895	-27.6422	-21.3042	(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	-10.8404	-23.1048	-46.4833	-70.6389	-94.2068	-94.9476	-93.8289	-79.0754	-57.4758	-33.3116	-14.5605	-8.5499	(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	3621.6660	(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	2681.7675	(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)	176.2705	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1202.7360	(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	5362.9680	(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	3621.6660	0.2100	760.5499	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2681.7675	0.2100	563.1712	(264)
Space and water heating			1323.7210	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	176.2705	0.1443	25.4413	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-575.7123	0.1339	-77.1068	
PV Unit electricity exported	-627.0237	0.1256	-78.7247	
Total			-155.8315	(269)
Total CO2, kg/year			1205.2601	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.5100	(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	3621.6660	1.1300	4092.4826	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2681.7675	1.1300	3030.3972	(278)
Space and water heating			7122.8799	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	176.2705	1.5338	270.3695	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-575.7123	1.4950	-860.6647	
PV Unit electricity exported	-627.0237	0.4608	-288.9637	
Total			-1149.6284	(283)
Total Primary energy kWh/year			6373.7218	(286)
Target Primary Energy Rate (TPER)			87.3100	(287)

Summary for Input Data

elmhurst energy

Property Reference	5-G-N Gas	**Issued on Date**	05/02/2024
Assessment Reference	5-G-N Gas	**Prop Type Ref**	5-G-N Gas
Property			

SAP Rating	83 B	**DER**	15.57	**TER**	17.54
Environmental	88 B	**% DER < TER**			11.23
CO_2 Emissions (t/year)	0.85	**DFEE**	47.38	**TFEE**	53.00
Compliance Check	See BREL	**% DFEE < TFEE**			10.61
% DPER < TPER	4.20	**DPER**	89.13	**TPER**	93.04

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	30.00 m	59.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	26.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	20.00	18.80	0.00	None	1.20	Enter Gross Area
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	18.00	7.80	0.00	None	10.20	Enter Gross Area
East	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	5.00	5.00	0.00	None	0.00	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	6.00	6.00	2.50	Stairwell Stairwell 2	0.00	Enter Gross Area
Wall to Stores	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	42.00	42.00	0.70	Garage Single 1 Inside	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter

Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	23.00	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	63.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	10.00	10.00	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling	Concrete floor slab, carpeted	100.00	49.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Exposed Floor - Solid	Lowest occupied	Other	0.11	None	0.00	0.00	55.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
North	Window	North	North	1.20	0
South	Window	South	South	8.00	0
Door	Door	South	South	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	7.00	0.05	0.05	No
E3 Sill	Independently assessed	3.00	0.05	0.05	No
E4 Jamb	Independently assessed	14.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	30.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	30.00	0.07	0.07	No
P7 Party Wall - Exposed floor (normal)	Independently assessed	21.00	0.16	0.16	No
E16 Corner (normal)	Independently assessed	15.00	0.09	0.09	No
E18 Party wall between dwellings	Independently assessed	6.00	0.06	0.06	No

Y-value	0.12	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00

Summary for Input Data

elmhurst energy

Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	Manufacturer	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	102	
In Winter	88.80	
In Summer	79.80	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2106	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	

25.0 Main Heating 2	None
26.0 Heat Networks	None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No

Summary for Input Data

Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From header tank
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	5-G-N Gas	**Issued on Date**	05/02/2024
Assessment Reference	5-G-N Gas	**Prop Type Ref**	5-G-N Gas
Property			

SAP Rating	83 B	**DER**	15.57	**TER**	17.54
Environmental	88 B	**% DER < TER**			11.23
CO_2 Emissions (t/year)	0.85	**DFEE**	47.38	**TFEE**	53.00
Compliance Check	See BREL	**% DFEE < TFEE**			10.61
% DPER < TPER	4.20	**DPER**	89.13	**TPER**	93.04

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	59.0000	(1b)	x 3.0000	(2b) =	177.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		177.0000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		1.5000	(17)
Infiltration rate		0.0750	(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) =	0.0694	(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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	86.4000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(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	
Window (Uw = 0.90)			9.2000	0.8687	7.9923			(27)
Door			2.2000	1.1000	2.4200			(26)
Heatloss Floor 1			55.0000	0.1100	6.0500			(28b)
North	20.0000	1.2000	18.8000	0.1400	2.6320	110.0000	2068.0000	(29a)
South	18.0000	10.2000	7.8000	0.1400	1.0920	110.0000	858.0000	(29a)
East	5.0000		5.0000	0.1400	0.7000	110.0000	550.0000	(29a)
Wall to Common	6.0000		6.0000	0.1100	0.6600	14.0000	84.0000	(29a)
Wall to Stores	42.0000		42.0000	0.1300	5.4600	110.0000	4620.0000	(29a)
External Roof 1	10.0000		10.0000	0.1100	1.1000	9.0000	90.0000	(30)
Total net area of external elements Aum(A, m2)			156.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.1063			(33)
Party Wall 1			23.0000	0.0000	0.0000	110.0000	2530.0000	(32)
Party Ceiling			49.0000			100.0000	4900.0000	(32b)
Internal Wall 1			63.0000			9.0000	567.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16267.0000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		275.7119	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0000	0.0500	0.3500
E3 Sill	3.0000	0.0500	0.1500
E4 Jamb	14.0000	0.0500	0.7000
E20 Exposed floor (normal)	30.0000	0.3200	9.6000
E7 Party floor between dwellings (in blocks of flats)	30.0000	0.0700	2.1000
P7 Party Wall - Exposed floor (normal)	21.0000	0.1600	3.3600
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	6.0000	0.0600	0.3600

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		17.9700	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	46.0763	(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	9.1384	9.0371	8.9358	8.4293	8.3280	7.8215	7.8215	7.7202	8.0241	8.3280	8.5306	8.7332	(38)
Heat transfer coeff	55.2147	55.1134	55.0121	54.5056	54.4043	53.8977	53.8977	53.7964	54.1004	54.4043	54.6069	54.8095	(39)
Average = Sum(39)m / 12 =												54.4802	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9358	0.9341	0.9324	0.9238	0.9221	0.9135	0.9135	0.9118	0.9170	0.9221	0.9255	0.9290	(40)
HLP (average)												0.9234	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.9532	(42)

Hot water usage for mixer showers

	62.4706	61.5141	60.1046	57.9363	55.9936	53.2757	51.1261	53.6391	54.9031	57.5951	60.3985	62.4142	(42a)

Hot water usage for baths

	24.0728	23.7094	23.1924	22.4182	21.7205	20.7600	20.0313	20.9224	21.3900	22.3417	23.3312	24.0537	(42b)

Hot water usage for other uses

	34.6330	33.3736	32.1142	30.8548	29.5954	28.3361	28.3361	29.5954	30.8548	32.1142	33.3736	34.6330	(42c)

Average daily hot water use (litres/day)		111.3987	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	121.1763	118.5971	115.4112	111.2094	107.3095	102.3718	99.4934	104.1570	107.1480	112.0510	117.1032	121.1008	(44)
Energy conte	178.3924	156.9279	164.9203	145.2672	138.2792	118.3896	109.9432	122.5947	124.2863	144.3890	158.2689	177.8455	(45)
Energy content (annual)										Total = Sum(45)m =		1739.5041	

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

	26.7589	23.5392	24.7380	21.7901	20.7419	17.7584	16.4915	18.3892	18.6429	21.6584	23.7403	26.6768	(46)

Water storage loss:		
Store volume	150.0000	(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

	231.7868	205.1551	218.3147	196.9392	191.6736	170.0616	163.3376	175.9891	175.9583	197.7834	209.9409	231.2399	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	231.7868	205.1551	218.3147	196.9392	191.6736	170.0616	163.3376	175.9891	175.9583	197.7834	209.9409	231.2399	(64)
										Total per year (kWh/year) = Sum(64)m =		2368.1801	(64)
12Total per year (kWh/year)												2368	(64)

Electric shower(s)

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

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

Heat gains from water heating, kWh/month

	102.0310	90.7603	97.5515	89.6390	88.6934	80.7021	79.2716	83.4782	82.6628	90.7249	93.9620	101.8491	(65)

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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	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	92.7357	102.6717	92.7357	95.8269	92.7357	95.8269	92.7357	92.7357	95.8269	92.7357	95.8269	92.7357	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	170.4180	172.1864	167.7301	158.2431	146.2675	135.0121	127.4928	125.7244	130.1807	139.6677	151.6433	162.8987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	(71)
Water heating gains (Table 5)	137.1384	135.0600	131.1176	124.4985	119.2115	112.0863	106.5479	112.2019	114.8094	121.9420	130.5028	136.8940	(72)
Total internal gains	455.5905	465.2165	446.8818	433.8669	413.5131	395.2237	379.0748	382.9604	393.1154	409.6438	433.2714	447.8268	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2000	10.6334	0.4000	0.7000	0.7700	2.4760	(74)
South	8.0000	46.7521	0.4000	0.7000	0.7700	72.5742	(78)

Solar gains	75.0501	123.5895	159.4440	184.0339	195.7141	190.2300	185.0573	176.6253	167.8261	133.8317	89.0796	64.7748	(83)
Total gains	530.6407	588.8059	606.3259	617.9008	609.2272	585.4536	564.1321	559.5857	560.9415	543.4756	522.3510	512.6017	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.8371	81.9875	82.1385	82.9018	83.0562	83.8367	83.8367	83.9946	83.5228	83.0562	82.7480	82.4421	
alpha	6.4558	6.4658	6.4759	6.5268	6.5371	6.5891	6.5891	6.5996	6.5682	6.5371	6.5165	6.4961	
util living area	0.9878	0.9751	0.9534	0.8936	0.7750	0.5816	0.4196	0.4411	0.6494	0.8841	0.9709	0.9900	(86)
MIT	20.3064	20.4539	20.6170	20.8125	20.9409	20.9923	20.9992	20.9989	20.9842	20.8509	20.5602	20.2787	(87)
Th 2	20.1371	20.1386	20.1400	20.1473	20.1488	20.1560	20.1560	20.1575	20.1531	20.1488	20.1458	20.1429	(88)
util rest of house	0.9840	0.9676	0.9394	0.8637	0.7211	0.5085	0.3396	0.3610	0.5766	0.8470	0.9609	0.9868	(89)
MIT 2	19.5230	19.6676	19.8247	20.0087	20.1132	20.1529	20.1558	20.1572	20.1460	20.0453	19.7783	19.5007	(90)
Living area fraction									fLA = Living area / (4) =			0.4407	(91)
MIT	19.8682	20.0141	20.1738	20.3629	20.4780	20.5228	20.5275	20.5281	20.5154	20.4003	20.1228	19.8435	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7182	19.8641	20.0238	20.2129	20.3280	20.3728	20.3775	20.3781	20.3654	20.2503	19.9728	19.6935	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9816	0.9648	0.9372	0.8662	0.7331	0.5276	0.3606	0.3820	0.5953	0.8519	0.9584	0.9847	(94)
Useful gains	520.9029	568.0647	568.2575	535.2486	446.6122	308.8585	203.4405	213.7760	333.9451	462.9720	500.6400	504.7721	(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	851.3128	824.7236	743.9750	616.6161	469.3991	311.1407	203.5983	214.0085	338.9609	525.0197	702.9461	849.1931	(97)
Space heating kWh	245.8250	172.4748	130.7338	58.5846	16.9534	0.0000	0.0000	0.0000	0.0000	46.1634	145.6604	256.2492	(98a)
Space heating requirement - total per year (kWh/year)												1072.6446	
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	245.8250	172.4748	130.7338	58.5846	16.9534	0.0000	0.0000	0.0000	0.0000	46.1634	145.6604	256.2492	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1072.6446	
Space heating per m2											(98c) / (4) =	18.1804	(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 %)	88.8000	(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	245.8250	172.4748	130.7338	58.5846	16.9534	0.0000	0.0000	0.0000	0.0000	46.1634	145.6604	256.2492	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	276.8299	194.2283	147.2228	65.9736	19.0917	0.0000	0.0000	0.0000	0.0000	51.9858	164.0320	288.5690	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	231.7868	205.1551	218.3147	196.9392	191.6736	170.0616	163.3376	175.9891	175.9583	197.7834	209.9409	231.2399	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.1919	83.6732	82.9488	81.6984	80.4627	79.8000	79.8000	79.8000	79.8000	81.3604	83.2564	84.2906	(217)
Fuel for water heating, kWh/month	275.3078	245.1860	263.1922	241.0563	238.2143	213.1097	204.6837	220.5377	220.4991	243.0953	252.1619	274.3364	(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	22.7098	20.5121	22.7098	21.9772	22.7098	21.9772	22.7098	22.7098	21.9772	22.7098	21.9772	22.7098	(231)
Lighting	17.9296	14.3838	12.9510	9.4885	7.3292	5.9880	6.6859	8.6906	11.2882	14.8108	16.7287	18.4279	(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	1207.9331	(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	2891.3804	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)

mechanical ventilation fans (SFP = 0.8400)	181.3896	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	267.3896	(231)
Electricity for lighting (calculated in Appendix L)	144.7021	(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	4511.4051	(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	1207.9331	0.2100	253.6660	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2891.3804	0.2100	607.1899	(264)
Space and water heating			860.8558	(265)
Pumps, fans and electric keep-hot	267.3896	0.1387	37.0902	(267)
Energy for lighting	144.7021	0.1443	20.8850	(268)
Total CO2, kg/year			918.8310	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.5700	(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	1207.9331	1.1300	1364.9644	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2891.3804	1.1300	3267.2598	(278)
Space and water heating			4632.2242	(279)
Pumps, fans and electric keep-hot	267.3896	1.5128	404.5070	(281)
Energy for lighting	144.7021	1.5338	221.9489	(282)
Total Primary energy kWh/year			5258.6801	(286)
Dwelling Primary energy Rate (DPER)			89.1300	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	59.0000 (1b)	x	3.0000 (2b)	=	177.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 59.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	177.0000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(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) =	20.0000 / (5) = 0.1130	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3630	(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) =	0.3358	(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	0.4281	0.4197	0.4113	0.3693	0.3610	0.3190	0.3190	0.3106	0.3358	0.3610	0.3777	0.3945	(22b)
Effective ac	0.5916	0.5881	0.5846	0.5682	0.5651	0.5509	0.5509	0.5482	0.5564	0.5651	0.5713	0.5778	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			9.2000	1.1450	10.5344			(27)
Heatloss Floor 1			55.0000	0.1300	7.1500			(28b)
North	20.0000	1.2000	18.8000	0.1800	3.3840			(29a)
South	18.0000	10.2000	7.8000	0.1800	1.4040			(29a)
East	5.0000		5.0000	0.1800	0.9000			(29a)
Wall to Common	6.0000		6.0000	0.1800	1.0800			(29a)
Wall to Stores	42.0000		42.0000	0.1800	7.5600			(29a)
External Roof 1	10.0000		10.0000	0.1100	1.1000			(30)
Total net area of external elements Aum(A, m2)			156.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.3124			(33)
Party Wall 1			23.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 259.1017 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0000	0.0500	0.3500
E3 Sill	3.0000	0.0500	0.1500
E4 Jamb	14.0000	0.0500	0.7000
E20 Exposed floor (normal)	30.0000	0.3200	9.6000
E7 Party floor between dwellings (in blocks of flats)	30.0000	0.0700	2.1000
P7 Party Wall - Exposed floor (normal)	21.0000	0.1600	3.3600
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	6.0000	0.0600	0.3600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.9700 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 53.2824 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.5576	34.3497	34.1460	33.1891	33.0100	32.1766	32.1766	32.0222	32.4976	33.0100	33.3722	33.7509	(38)
Heat transfer coeff	87.8399	87.6321	87.4283	86.4714	86.2924	85.4589	85.4589	85.3046	85.7800	86.2924	86.6546	87.0332	(39)

Average = Sum(39)m / 12 = 86.4706

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4888	1.4853	1.4818	1.4656	1.4626	1.4485	1.4485	1.4458	1.4539	1.4626	1.4687	1.4751	(40)
HLP (average)												1.4656	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9532 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	56.9687	56.1126	54.8650	52.4781	50.7165	48.7521	47.6355	48.8736	50.2308	52.3400	54.7783	56.7504	(42a)
Hot water usage for baths	24.6216	24.2560	23.7410	22.7916	22.0807	21.2923	20.8665	21.3779	21.9346	22.7781	23.7471	24.5384	(42b)
Hot water usage for other uses	34.6330	33.3736	32.1142	30.8548	29.5954	28.3361	28.3361	29.5954	30.8548	32.1142	33.3736	34.6330	(42c)
Average daily hot water use (litres/day)												106.8359	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	116.2233	113.7421	110.7202	106.1245	102.3926	98.3805	96.8381	99.8470	103.0203	107.2324	111.8990	115.9218	(44)
Energy conte	184.0693	161.9672	170.1729	145.2791	137.8402	120.9703	117.1173	123.6314	127.0343	145.5133	159.4206	181.5055	(45)
Energy content (annual)										Total = Sum(45)m =		1774.5214	
Distribution loss (46)m = 0.15 x (45)m	27.6104	24.2951	25.5259	21.7919	20.6760	18.1455	17.5676	18.5447	19.0551	21.8270	23.9131	27.2258	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	230.6642	204.0530	216.7678	190.3709	184.4351	166.0622	163.7122	170.2263	172.1261	192.1082	204.5124	228.1004	(62)
WWHRS	-26.0437	-23.0333	-24.1191	-19.9716	-18.6128	-15.9271	-14.9291	-15.8756	-16.4788	-19.4267	-22.0081	-25.5614	(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	204.6205	181.0197	192.6487	170.3994	165.8223	150.1351	148.7831	154.3507	155.6473	172.6815	182.5044	202.5390	(64)
										Total per year (kWh/year) = Sum(64)m =		2081.1516	(64)
12Total per year (kWh/year)												2081	(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	98.4790	87.5227	93.8584	84.3788	83.1078	76.2961	76.2174	78.3834	78.3124	85.6591	89.0808	97.6265	(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	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.1399	99.7977	90.1399	93.1445	90.1399	93.1445	90.1399	90.1399	93.1445	90.1399	93.1445	90.1399	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	170.4180	172.1864	167.7301	158.2431	146.2675	135.0121	127.4928	125.7244	130.1807	139.6677	151.6433	162.8987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	(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)	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	(71)
Water heating gains (Table 5)	132.3642	130.2421	126.1538	117.1927	111.7040	105.9668	102.4428	105.3540	108.7672	115.1332	123.7234	131.2184	(72)

Total internal gains

	448.2204	457.5246	439.3221	423.8787	403.4097	386.4218	372.3738	373.5166	384.3908	400.2391	423.8096	439.5554 (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	1.2000	10.6334	0.6300	0.7000	0.7700	3.8996	(74)
South	8.0000	46.7521	0.6300	0.7000	0.7700	114.3043	(78)

Solar gains	118.2040	194.6534	251.1244	289.8534	308.2497	299.6122	291.4653	278.1848	264.3261	210.7850	140.3003	102.0204 (83)
Total gains	566.4244	652.1780	690.4465	713.7321	711.6594	686.0340	663.8391	651.7014	648.7169	611.0241	564.1099	541.5757 (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	48.3424	48.4570	48.5699	49.1074	49.2093	49.6892	49.6892	49.7791	49.5033	49.2093	49.0036	48.7904	
alpha	4.2228	4.2305	4.2380	4.2738	4.2806	4.3126	4.3126	4.3186	4.3002	4.2806	4.2669	4.2527	
util living area	0.9889	0.9791	0.9638	0.9285	0.8559	0.7103	0.5442	0.5734	0.7724	0.9291	0.9787	0.9907	(86)
MIT	19.4892	19.7124	19.9954	20.3584	20.6764	20.9000	20.9752	20.9686	20.8478	20.4482	19.9094	19.4543	(87)
Th 2	19.6959	19.6986	19.7012	19.7134	19.7157	19.7264	19.7264	19.7284	19.7223	19.7157	19.7110	19.7062	(88)
util rest of house	0.9851	0.9721	0.9512	0.9017	0.7989	0.6018	0.3977	0.4288	0.6762	0.8972	0.9703	0.9876	(89)
MIT 2	17.9975	18.2806	18.6364	19.0878	19.4513	19.6721	19.7195	19.7187	19.6284	19.2038	18.5410	17.9604	(90)
Living area fraction										fLA = Living area / (4) =		0.4407	(91)
MIT	18.6549	18.9116	19.2353	19.6477	19.9911	20.2132	20.2729	20.2695	20.1658	19.7522	19.1440	18.6187	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6549	18.9116	19.2353	19.6477	19.9911	20.2132	20.2729	20.2695	20.1658	19.7522	19.1440	18.6187	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9809	0.9665	0.9454	0.9001	0.8128	0.6464	0.4628	0.4929	0.7129	0.8983	0.9654	0.9839	(94)
Useful gains	555.6303	630.3455	652.7456	642.4249	578.4238	443.4389	307.2128	321.2163	462.4495	548.8910	544.5721	532.8340	(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	1260.9301	1227.8619	1113.4262	929.3730	715.4616	479.6984	313.8814	330.0863	520.3200	789.7622	1043.6667	1254.9081	(97)
Space heating kWh	524.7430	401.5310	342.7463	206.6026	101.9561	0.0000	0.0000	0.0000	0.0000	179.2081	359.3481	537.2231	(98a)
Space heating requirement - total per year (kWh/year)												2653.3585	
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	524.7430	401.5310	342.7463	206.6026	101.9561	0.0000	0.0000	0.0000	0.0000	179.2081	359.3481	537.2231	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2653.3585	
Space heating per m2										(98c) / (4) =		44.9722	(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	524.7430	401.5310	342.7463	206.6026	101.9561	0.0000	0.0000	0.0000	0.0000	179.2081	359.3481	537.2231	(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)	568.5190	435.0282	371.3395	223.8382	110.4617	0.0000	0.0000	0.0000	0.0000	194.1583	389.3262	582.0402	(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	204.6205	181.0197	192.6487	170.3994	165.8223	150.1351	148.7831	154.3507	155.6473	172.6815	182.5044	202.5390	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0765	85.7933	85.3369	84.4929	83.0030	79.8000	79.8000	79.8000	79.8000	84.1431	85.5502	86.1401	(217)
Fuel for water heating, kWh/month	237.7193	210.9951	225.7508	201.6730	199.7786	188.1392	186.4450	193.4219	195.0468	205.2237	213.3301	235.1273	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	18.7293	15.0253	13.5286	9.9117	7.6561	6.2551	6.9841	9.0782	11.7917	15.4713	17.4748	19.2498	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.2120	-29.4881	-43.8522	-51.0787	-56.6344	-53.4504	-52.8198	-49.1106	-42.8049	-34.5301	-22.5796	-17.3622	(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	-8.5838	-18.3224	-36.9068	-56.1445	-74.9228	-75.5104	-74.5983	-62.8277	-45.6279	-26.4105	-11.5295	-6.7665	(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	2874.7113	(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	2492.6507	(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)	151.1561	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-972.0743	(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	4632.4438	(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	2874.7113	0.2100	603.6894	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2492.6507	0.2100	523.4567	(264)
Space and water heating			1127.1460	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	151.1561	0.1443	21.8165	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9231	0.1339	-63.4373	
PV Unit electricity exported	-498.1512	0.1255	-62.5329	
Total			-125.9702	(269)
Total CO2, kg/year			1034.9216	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.5400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2874.7113	1.1300	3248.4237	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2492.6507	1.1300	2816.6953	(278)
Space and water heating			6065.1190	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	151.1561	1.5338	231.8482	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9231	1.4947	-708.3570	
PV Unit electricity exported	-498.1512	0.4608	-229.5303	
Total			-937.8873	(283)
Total Primary energy kWh/year			5489.1807	(286)
Target Primary Energy Rate (TPER)			93.0400	(287)

A5 APPENDIX 4 – GREEN SAP DATA

SAP 10.2 Summary (GREEN)					
Sample Dwelling Ref	Sample Quantity	Area (m2)	DER (kgCO2/m2	DPER (kWpe/m2)	DFEE (kWh/m2)
1-M-N Gas	4	72.00	2.98	33.57	35.00
1-M-S Gas	4	72.00	3.02	33.99	35.94
1-T-N Gas	4	72.00	4.15	45.41	51.41
1-T-S Gas	4	72.00	4.20	45.99	52.33
2-G-N Gas	2	78.00	3.55	39.13	43.78
2-G-S Gas	1	78.00	3.47	38.30	42.38
3-G-N Gas	2	54.30	4.26	47.55	52.60
3-G-S Gas	3	54.30	4.22	47.17	51.98
4-M-N Gas	2	73.00	3.08	34.58	36.75
4-T-N Gas	2	73.00	3.92	43.06	48.34
5-G-N Gas	2	59.00	3.91	43.69	47.38
Area Weighted Value		2068	3.7	41.1	45.2

Summary for Input Data

elmhurst energy

Property Reference	1-M-N ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	1-M-N ASHP + PV	**Prop Type Ref**	1-M-N Gas
Property			

SAP Rating	88 B	**DER**	2.98	**TER**	14.09
Environmental	98 A	**% DER < TER**			78.85
CO_2 Emissions (t/year)	0.19	**DFEE**	35.00	**TFEE**	41.79
Compliance Check	See BREL	**% DFEE < TFEE**			16.26
% DPER < TPER	54.83	**DPER**	33.57	**TPER**	74.32

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Mid-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	25.00 m	72.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	28.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	24.00	22.50	0.00	None	1.50	Enter Gross Area
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	24.00	20.70	0.00	None	3.30	Enter Gross Area
West	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	28.00	21.67	0.00	None	6.33	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	28.00	25.80	2.50	Stairwell Stairwell 2	2.20	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	93.00

10.1 Party Ceilings

Summary for Input Data

elmhurst energy

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling	Concrete floor slab, carpeted	100.00	72.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Exposed Floor - Solid	Lowest occupied	Other	0.11	Garage Single 1 Inside	0.70	0.00	20.00

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Concrete floor slab, carpeted	100.00	47.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
North	Window	North	North	1.50	0
Opening	Window	West	West	6.33	0
Opening	Window	South	South	3.30	0
Opening	Door	Wall to Common	North	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	8.50	0.05	0.05	No
E3 Sill	Independently assessed	7.30	0.05	0.05	No
E4 Jamb	Independently assessed	16.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	6.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	100.00	0.07	0.07	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	6.00	0.02	0.02	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Independently assessed	8.00	0.00	0.00	No

Y-value	0.09	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

Summary for Input Data

elmhurst energy

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	SAP table	
Description	Default ASHP	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Electricity	
SAP Code	224	
In Winter	219.30	
In Summer	190.40	
Controls SAP Code	2210	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From header tank
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

Summary for Input Data

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store	None	

32.0 Photovoltaic Unit	One Dwelling	
Export Capable Meter?	Yes	
Connected To Dwelling	Yes	
Diverter	No	
Battery Capacity [kWh]	0.00	

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.90	South	Horizontal	Modest	No	No	0.80		

34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	1-M-N ASHP + PV	Issued on Date	05/02/2024
Assessment Reference	1-M-N ASHP + PV	Prop Type Ref	1-M-N Gas
Property			

SAP Rating	88 B	DER	2.98	TER	14.09
Environmental	98 A	% DER < TER			78.85
CO_2 Emissions (t/year)	0.19	DFEE	35.00	TFEE	41.79
Compliance Check	See BREL	% DFEE < TFEE			16.26
% DPER < TPER	54.83	DPER	33.57	TPER	74.32

Assessor Details	Mr. Andrew Sturt	Assessor ID	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	72.0000	(1b)	x 3.0000	(2b) =	216.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		216.0000	(5)

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2. Ventilation rate

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	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	0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		1.5000	(17)
Infiltration rate		0.0750	(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) =	0.0694	(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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		86.4000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(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	
Window (Uw = 0.90)			11.1300	0.8687	9.6689			(27)
Door			2.2000	1.1000	2.4200			(26)
Heatloss Floor 1			20.0000	0.1021	2.0427			(28b)
North	24.0000	1.5000	22.5000	0.1400	3.1500	110.0000	2475.0000	(29a)
South	24.0000	3.3000	20.7000	0.1400	2.8980	110.0000	2277.0000	(29a)
West	28.0000	6.3300	21.6700	0.1400	3.0338	110.0000	2383.7000	(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1100	2.8380	14.0000	361.2000	(29a)
Total net area of external elements Aum(A, m2)			124.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0514			(33)
Party Floor 1			47.0000			80.0000	3760.0000	(32d)
Party Ceiling			72.0000			100.0000	7200.0000	(32b)
Internal Wall 1			93.0000			9.0000	837.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19293.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		267.9708 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E3 Sill	7.3000	0.0500	0.3650	
E4 Jamb	16.0000	0.0500	0.8000	
E20 Exposed floor (normal)	6.0000	0.3200	1.9200	
E7 Party floor between dwellings (in blocks of flats)	100.0000	0.0700	7.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.6300	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	36.6814	(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	11.1520	11.0284	10.9047	10.2866	10.1630	9.5448	9.5448	9.4212	9.7921	10.1630	10.4102	10.6575	(38)
Heat transfer coeff	47.8334	47.7098	47.5862	46.9680	46.8444	46.2263	46.2263	46.1026	46.4735	46.8444	47.0917	47.3389	(39)
Average = Sum(39)m / 12 =												46.9371	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6644	0.6626	0.6609	0.6523	0.6506	0.6420	0.6420	0.6403	0.6455	0.6506	0.6541	0.6575	(40)
HLP (average)												0.6519	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2937	(42)
Hot water usage for mixer showers	68.7304	67.6781	66.1274	63.7418	61.6044	58.6142	56.2491	59.0140	60.4047	63.3663	66.4507	68.6684	(42a)
Hot water usage for baths	26.4729	26.0733	25.5047	24.6534	23.8861	22.8298	22.0285	23.0084	23.5227	24.5692	25.6574	26.4519	(42b)
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
Average daily hot water use (litres/day)												122.5649	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.3229	130.4848	126.9794	122.3563	118.0655	112.6328	109.4664	114.5974	117.8884	123.2829	128.8415	133.2399	(44)
Energy conte	196.2743	172.6578	181.4510	159.8279	152.1393	130.2561	120.9636	134.8832	136.7447	158.8624	174.1336	195.6726	(45)
Energy content (annual)										Total = Sum(45)m =		1913.8664	
Distribution loss (46)m = 0.15 x (45)m	29.4411	25.8987	27.2176	23.9742	22.8209	19.5384	18.1445	20.2325	20.5117	23.8294	26.1200	29.3509	(46)
Water storage loss:													
Store volume												150.0000	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(64)
										Total per year (kWh/year) = Sum(64)m =		2542.5424	(64)
12Total per year (kWh/year)												2543	(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	107.9767	95.9905	103.0480	94.4804	93.3018	84.6477	82.9359	87.5642	86.8052	95.5373	99.2370	107.7766	(65)

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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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.0875	121.8826	110.0875	113.7571	110.0875	113.7571	110.0875	110.0875	113.7571	110.0875	113.7571	110.0875	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)	145.1300	142.8430	138.5053	131.2227	125.4057	117.5663	111.4730	117.6938	120.5628	128.4103	137.8292	144.8611	(72)
Total internal gains	517.5419	529.1453	507.7325	492.8788	469.2029	448.6972	430.0251	434.1506	445.9693	464.3878	491.6656	508.3638	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.5000	10.6334	0.4000	0.7000	0.7700	3.0950	(74)
South	3.3000	46.7521	0.4000	0.7000	0.7700	29.9368	(78)
West	6.3300	19.6403	0.4000	0.7000	0.7700	24.1236	(80)

Solar gains	57.1554	102.1344	150.2211	200.0753	234.2111	236.2656	226.2770	200.6994	167.7122	115.9188	69.3827	48.2864	(83)

Total gains	574.6973	631.2796	657.9536	692.9541	703.4141	684.9629	656.3021	634.8500	613.6814	580.3066	561.0483	556.6502	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	112.0434	112.3337	112.6255	114.1078	114.4089	115.9388	115.9388	116.2497	115.3219	114.4089	113.8082	113.2138	
alpha	8.4696	8.4889	8.5084	8.6072	8.6273	8.7293	8.7293	8.7500	8.6881	8.6273	8.5872	8.5476	
util living area													
	0.9820	0.9601	0.9148	0.7887	0.6155	0.4318	0.3099	0.3340	0.5216	0.8029	0.9508	0.9853	(86)
MIT	20.6395	20.7508	20.8645	20.9664	20.9959	20.9998	21.0000	21.0000	20.9992	20.9673	20.8134	20.6200	(87)
Th 2	20.3724	20.3740	20.3755	20.3831	20.3847	20.3923	20.3923	20.3939	20.3893	20.3847	20.3816	20.3785	(88)
util rest of house													
	0.9771	0.9504	0.8964	0.7564	0.5762	0.3908	0.2671	0.2900	0.4759	0.7657	0.9374	0.9812	(89)
MIT 2	20.0537	20.1613	20.2670	20.3597	20.3823	20.3922	20.3923	20.3938	20.3889	20.3630	20.2283	20.0404	(90)
Living area fraction										fLA = Living area / (4) =		0.3889	(91)
MIT	20.2815	20.3905	20.4994	20.5957	20.6209	20.6285	20.6286	20.6296	20.6262	20.5980	20.4558	20.2658	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2815	20.3905	20.4994	20.5957	20.6209	20.6285	20.6286	20.6296	20.6262	20.5980	20.4558	20.2658	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9763	0.9507	0.9003	0.7678	0.5914	0.4068	0.2838	0.3071	0.4937	0.7790	0.9392	0.9804	(94)
Useful gains	561.0524	600.1507	592.3552	532.0464	415.9829	278.6121	186.2265	194.9899	302.9593	452.0628	526.9270	545.7364	(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													
	764.4508	739.0501	666.1762	549.3217	417.8945	278.6765	186.2288	194.9943	303.2959	468.3510	628.9478	760.5369	(97)
Space heating kWh													
	151.3284	93.3404	54.9228	12.4382	1.4222	0.0000	0.0000	0.0000	0.0000	12.1184	73.4550	159.8116	(98a)
Space heating requirement - total per year (kWh/year)												558.8370	
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													
	151.3284	93.3404	54.9228	12.4382	1.4222	0.0000	0.0000	0.0000	0.0000	12.1184	73.4550	159.8116	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												558.8370	
Space heating per m2											(98c) / (4) =	7.7616	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												219.3000	(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													
	151.3284	93.3404	54.9228	12.4382	1.4222	0.0000	0.0000	0.0000	0.0000	12.1184	73.4550	159.8116	(98)
Space heating efficiency (main heating system 1)													
	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)													
	69.0052	42.5629	25.0446	5.6718	0.6485	0.0000	0.0000	0.0000	0.0000	5.5259	33.4952	72.8735	(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													
	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(64)
Efficiency of water heater												190.4000	(216)
(217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(217)
Fuel for water heating, kWh/month													
	131.1285	116.0110	123.3432	111.0819	107.9484	95.5505	91.5746	98.8853	98.9583	111.4794	118.5954	130.8125	(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	18.8002	16.9808	18.8002	18.1937	18.8002	18.1937	18.8002	18.8002	18.1937	18.8002	18.1937	18.8002	(231)
Lighting	21.2844	17.0751	15.3743	11.2638	8.7005	7.1084	7.9369	10.3167	13.4004	17.5820	19.8588	21.8759	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-9.5911	-16.7124	-30.0775	-41.0258	-50.2430	-49.1047	-47.9983	-42.0467	-32.2006	-21.3284	-11.3958	-7.8612	(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	-1.5510	-4.1894	-11.0628	-21.1822	-32.0374	-33.8393	-32.9965	-25.2347	-15.4922	-6.9555	-2.2900	-1.1383	(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												254.8276	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												190.4000	
Water heating fuel used												1335.3689	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)													
mechanical ventilation fans (SFP = 0.8400)												221.3568	(230a)
Total electricity for the above, kWh/year												221.3568	(231)

Electricity for lighting (calculated in Appendix L)	171.7772	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-547.5548	(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	1435.7758	(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	254.8276	0.1588	40.4741	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1335.3689	0.1409	188.1116	(264)
Space and water heating			228.5856	(265)
Pumps, fans and electric keep-hot	221.3568	0.1387	30.7049	(267)
Energy for lighting	171.7772	0.1443	24.7928	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-359.5856	0.1310	-47.0988	
PV Unit electricity exported	-187.9692	0.1205	-22.6544	
Total			-69.7532	(269)
Total CO2, kg/year			214.3301	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.9800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	254.8276	1.5879	404.6468	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1335.3689	1.5209	2030.9338	(278)
Space and water heating			2435.5806	(279)
Pumps, fans and electric keep-hot	221.3568	1.5128	334.8686	(281)
Energy for lighting	171.7772	1.5338	263.4776	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-359.5856	1.4839	-533.5803	
PV Unit electricity exported	-187.9692	0.4421	-83.1063	
Total			-616.6866	(283)
Total Primary energy kWh/year			2417.2402	(286)
Dwelling Primary energy Rate (DPER)			33.5700	(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	72.0000 (1b)	x	3.0000 (2b)	=	216.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 72.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	216.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.1389	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3889	(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) =	0.3597	(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	0.4586	0.4497	0.4407	0.3957	0.3867	0.3417	0.3417	0.3327	0.3597	0.3867	0.4047	0.4227	(22b)

Effective ac	0.6052	0.6011	0.5971	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5893 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			11.1300	1.1450	12.7443			(27)
Heatloss Floor 1			20.0000	0.1300	2.6000			(28b)
North	24.0000	1.5000	22.5000	0.1800	4.0500			(29a)
South	24.0000	3.3000	20.7000	0.1800	3.7260			(29a)
West	28.0000	6.3300	21.6700	0.1800	3.9006			(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1800	4.6440			(29a)
Total net area of external elements Aum(A, m2)			124.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.8649			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		247.9708 (35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3 Sill	7.3000	0.0500	0.3650
E4 Jamb	16.0000	0.0500	0.8000
E20 Exposed floor (normal)	6.0000	0.3200	1.9200
E7 Party floor between dwellings (in blocks of flats)	100.0000	0.0700	7.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		10.6300 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.4949 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.1371	42.8460	42.5606	41.2203	40.9695	39.8022	39.8022	39.5860	40.2518	40.9695	41.4768	42.0072	(38)
Heat transfer coeff	87.6320	87.3408	87.0555	85.7152	85.4644	84.2970	84.2970	84.0809	84.7467	85.4644	85.9717	86.5021	(39)
Average = Sum(39)m / 12 =												85.7140	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2171	1.2131	1.2091	1.1905	1.1870	1.1708	1.1708	1.1678	1.1770	1.1870	1.1941	1.2014	(40)
HLP (average)												1.1905	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.2937 (42)

Hot water usage for mixer showers

	62.6772	61.7353	60.3627	57.7366	55.7986	53.6373	52.4088	53.7710	55.2642	57.5847	60.2673	62.4371	(42a)

Hot water usage for baths

	27.0765	26.6744	26.1081	25.0640	24.2822	23.4152	22.9470	23.5093	24.1216	25.0492	26.1148	26.9849	(42b)

Hot water usage for other uses

	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)

Average daily hot water use (litres/day)		117.5446 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.8733	125.1431	121.8181	116.7617	112.6557	108.2413	106.5446	109.8552	113.3469	117.9812	123.1155	127.5416	(44)
Energy conte	202.5201	178.2021	187.2299	159.8409	151.6562	133.0953	128.8565	136.0237	139.7680	160.0994	175.4006	199.6994	(45)
Energy content (annual)										Total = Sum(45)m =		1952.3920	
Distribution loss (46)m = 0.15 x (45)m	30.3780	26.7303	28.0845	23.9761	22.7484	19.9643	19.3285	20.4036	20.9652	24.0149	26.3101	29.9549	(46)

Water storage loss:		
Store volume		150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.3938 (48)
Temperature factor from Table 2b		0.5400 (49)
Enter (49) or (54) in (55)		0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.1150	220.2878	233.8248	204.9327	198.2511	178.1872	175.4514	182.6186	184.8599	206.6943	220.4925	246.2943	(62)
WWHRS	-28.6534	-25.3413	-26.5360	-21.9728	-20.4779	-17.5231	-16.4251	-17.4664	-18.1300	-21.3733	-24.2134	-28.1228	(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	220.4616	194.9465	207.2888	182.9599	177.7732	160.6641	159.0263	165.1522	166.7298	185.3210	196.2791	218.1715	(64)
										Total per year (kWh/year) = Sum(64)m =		2234.7740	(64)
12Total per year (kWh/year)												2235	(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

	104.6138	92.9208	99.5299	89.2206	87.7016	80.3277	80.1207	82.5038	82.5463	90.5090	94.3942	103.6760	(65)

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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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.9910	118.4543	106.9910	110.5574	106.9910	110.5574	106.9910	106.9910	110.5574	106.9910	110.5574	106.9910	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)

Water heating gains (Table 5)

	140.6100	138.2750	133.7767	123.9175	117.8785	111.5662	107.6891	110.8922	114.6477	121.6518	131.1030	139.3494 (72)

Total internal gains

	509.9255	521.1490	499.9074	482.3739	458.5793	439.4975	423.1448	424.2526	436.8545	454.5329	481.7397	499.7557 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.5000	10.6334	0.6300	0.7000	0.7700	4.8746	(74)
South	3.3000	46.7521	0.6300	0.7000	0.7700	47.1505	(78)
West	6.3300	19.6403	0.6300	0.7000	0.7700	37.9947	(80)

Solar gains	90.0198	160.8616	236.5982	315.1185	368.8825	372.1184	356.3862	316.1015	264.1466	182.5720	109.2778	76.0510	(83)
Total gains	599.9452	682.0106	736.5056	797.4924	827.4618	811.6159	779.5310	740.3541	701.0012	637.1049	591.0175	575.8067	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.5937	56.7823	56.9685	57.8593	58.0290	58.8326	58.8326	58.9839	58.5205	58.0290	57.6866	57.3329	
alpha	4.7729	4.7855	4.7979	4.8573	4.8686	4.9222	4.9222	4.9323	4.9014	4.8686	4.8458	4.8222	
util living area	0.9916	0.9836	0.9671	0.9179	0.8125	0.6319	0.4693	0.5120	0.7476	0.9348	0.9831	0.9930	(86)
MIT	19.7143	19.9107	20.1847	20.5461	20.8176	20.9603	20.9924	20.9885	20.9095	20.5635	20.0873	19.6915	(87)
Th 2	19.9063	19.9096	19.9127	19.9276	19.9304	19.9434	19.9434	19.9459	19.9384	19.9304	19.9248	19.9189	(88)
util rest of house	0.9889	0.9785	0.9565	0.8914	0.7560	0.5409	0.3600	0.4000	0.6627	0.9079	0.9768	0.9908	(89)
MIT 2	18.4356	18.6862	19.0317	19.4803	19.7818	19.9216	19.9411	19.9420	19.8805	19.5122	18.9229	18.4155	(90)
Living area fraction									fLA = Living area / (4) =			0.3889	(91)
MIT	18.9329	19.1624	19.4801	19.8948	20.1846	20.3255	20.3500	20.3490	20.2807	19.9210	19.3757	18.9118	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9329	19.1624	19.4801	19.8948	20.1846	20.3255	20.3500	20.3490	20.2807	19.9210	19.3757	18.9118	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9856	0.9739	0.9513	0.8905	0.7706	0.5751	0.4027	0.4437	0.6920	0.9076	0.9726	0.9879	(94)
Useful gains	591.3335	664.1884	700.6116	710.1476	637.6682	466.7653	313.8892	328.4956	485.1263	578.2642	574.8081	568.8538	(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	1282.3056	1245.6867	1129.9876	942.4230	725.1327	482.6459	316.1104	332.0339	523.7920	796.6168	1055.3631	1272.5968	(97)
Space heating kWh	514.0833	390.7668	319.4558	167.2382	65.0736	0.0000	0.0000	0.0000	0.0000	162.4543	345.9996	523.5848	(98a)
Space heating requirement - total per year (kWh/year)												2488.6565	
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	514.0833	390.7668	319.4558	167.2382	65.0736	0.0000	0.0000	0.0000	0.0000	162.4543	345.9996	523.5848	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2488.6565	
Space heating per m2											(98c) / (4) =	34.5647	(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	514.0833	390.7668	319.4558	167.2382	65.0736	0.0000	0.0000	0.0000	0.0000	162.4543	345.9996	523.5848	(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)	556.9700	423.3660	346.1059	181.1898	70.5023	0.0000	0.0000	0.0000	0.0000	176.0069	374.8642	567.2642	(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	220.4616	194.9465	207.2888	182.9599	177.7732	160.6641	159.0263	165.1522	166.7298	185.3210	196.2791	218.1715	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8926	85.5872	85.0263	83.8588	82.0277	79.8000	79.8000	79.8000	79.8000	83.7658	85.3172	85.9489	(217)
Fuel for water heating, kWh/month	256.6713	227.7752	243.7938	218.1761	216.7233	201.3335	199.2810	206.9577	208.9346	221.2371	230.0581	253.8387	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.2306	17.8342	16.0577	11.7646	9.0873	7.4244	8.2897	10.7753	13.9961	18.3636	20.7417	22.8485	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.4748	-35.6060	-52.7941	-61.2938	-67.7684	-63.8665	-63.0909	-58.7425	-51.3386	-41.5854	-27.2987	-21.0338	(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	-10.6659	-22.7391	-45.7593	-69.5549	-92.7759	-93.5095	-92.4024	-77.8603	-56.5795	-32.7828	-14.3258	-8.4113	(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	2696.2692	(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	2684.7803	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	179.4138	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1186.2601	(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	4460.2032	(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	2696.2692	0.2100	566.2165	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2684.7803	0.2100	563.8039	(264)
Space and water heating			1130.0204	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	179.4138	0.1443	25.8950	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.8934	0.1339	-76.1900	
PV Unit electricity exported	-617.3667	0.1255	-77.5087	
Total			-153.6988	(269)
Total CO2, kg/year			1014.1459	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.0900	(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	2696.2692	1.1300	3046.7842	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2684.7803	1.1300	3033.8018	(278)
Space and water heating			6080.5860	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	179.4138	1.5338	275.1909	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.8934	1.4949	-850.4577	
PV Unit electricity exported	-617.3667	0.4608	-284.5002	
Total			-1134.9579	(283)
Total Primary energy kWh/year			5350.9198	(286)
Target Primary Energy Rate (TPER)			74.3200	(287)

Summary for Input Data

elmhurst energy

Property Reference	1-M-S ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	1-M- S ASHP + PV	**Prop Type Ref**	1-M-S Gas
Property			

SAP Rating	87 B	**DER**	3.02	**TER**	14.39
Environmental	98 A	**% DER < TER**			79.01
CO_2 Emissions (t/year)	0.19	**DFEE**	35.94	**TFEE**	43.18
Compliance Check	See BREL	**% DFEE < TFEE**			16.78
% DPER < TPER	55.24	**DPER**	33.99	**TPER**	75.94

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Mid-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	25.00 m	72.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	28.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	24.00	22.50	0.00	None	1.50	Enter Gross Area
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	24.00	20.70	0.00	None	3.30	Enter Gross Area
East	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	28.00	21.67	0.00	None	6.33	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	28.00	25.80	2.50	Stairwell Stairwell 2	2.20	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	93.00

10.1 Party Ceilings

Summary for Input Data

elmhurst energy

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling	Concrete floor slab, carpeted	100.00	72.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Exposed Floor - Solid	Lowest occupied	Other	0.11	Garage Single 1 Inside	0.70	0.00	20.00

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Concrete floor slab, carpeted	100.00	47.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
South	Window	South	South	1.50	0
East	Window	East	East	6.33	0
North	Window	North	North	3.30	0
Opening	Door	Wall to Common	North	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	8.50	0.05	0.05	No
E3 Sill	Independently assessed	7.30	0.05	0.05	No
E4 Jamb	Independently assessed	16.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	6.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	100.00	0.07	0.07	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	6.00	0.02	0.02	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Independently assessed	8.00	0.00	0.00	No

Y-value	0.09	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

Summary for Input Data

elmhurst energy

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	SAP table	
Description	Default ASHP	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Electricity	
SAP Code	224	
In Winter	219.30	
In Summer	190.40	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2210	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From header tank
Bath Count	1

Summary for Input Data

Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
32.0 Photovoltaic Unit	One Dwelling	
Export Capable Meter?	Yes	
Connected To Dwelling	Yes	
Diverter	No	
Battery Capacity [kWh]	0.00	

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.90	South	Horizontal	Modest	No	No	0.80		

34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	1-M-S ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	1-M- S ASHP + PV	**Prop Type Ref**	1-M-S Gas
Property			

SAP Rating	87 B	**DER**	3.02	**TER**	14.39
Environmental	98 A	**% DER < TER**			79.01
CO_2 Emissions (t/year)	0.19	**DFEE**	35.94	**TFEE**	43.18
Compliance Check	See BREL	**% DFEE < TFEE**			16.78
% DPER < TPER	55.24	**DPER**	33.99	**TPER**	75.94

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	72.0000 (1b)	x	3.0000 (2b)	=	216.0000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	216.0000	(5)

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2. Ventilation rate

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			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		0 * 10 =	0.0000	(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) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			1.5000	(17)
Infiltration rate			0.0750	(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) =	0.0694	(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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		86.4000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			11.1300	0.8687	9.6689			(27)
Door			2.2000	1.1000	2.4200			(26)
Heatloss Floor 1			20.0000	0.1021	2.0427			(28b)
South	24.0000	1.5000	22.5000	0.1400	3.1500	110.0000	2475.0000	(29a)
North	24.0000	3.3000	20.7000	0.1400	2.8980	110.0000	2277.0000	(29a)
East	28.0000	6.3300	21.6700	0.1400	3.0338	110.0000	2383.7000	(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1100	2.8380	14.0000	361.2000	(29a)
Total net area of external elements Aum(A, m2)			124.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0514			(33)
Party Floor 1			47.0000			80.0000	3760.0000	(32d)
Party Ceiling			72.0000			100.0000	7200.0000	(32b)
Internal Wall 1			93.0000			9.0000	837.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	19293.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		267.9708 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E3 Sill	7.3000	0.0500	0.3650	
E4 Jamb	16.0000	0.0500	0.8000	
E20 Exposed floor (normal)	6.0000	0.3200	1.9200	
E7 Party floor between dwellings (in blocks of flats)	100.0000	0.0700	7.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0000	0.0000	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.6300	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	36.6814	(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	11.1520	11.0284	10.9047	10.2866	10.1630	9.5448	9.5448	9.4212	9.7921	10.1630	10.4102	10.6575	(38)
Heat transfer coeff	47.8334	47.7098	47.5862	46.9680	46.8444	46.2263	46.2263	46.1026	46.4735	46.8444	47.0917	47.3389	(39)
Average = Sum(39)m / 12 =												46.9371	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6644	0.6626	0.6609	0.6523	0.6506	0.6420	0.6420	0.6403	0.6455	0.6506	0.6541	0.6575	(40)
HLP (average)												0.6519	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2937	(42)
Hot water usage for mixer showers	68.7304	67.6781	66.1274	63.7418	61.6044	58.6142	56.2491	59.0140	60.4047	63.3663	66.4507	68.6684	(42a)
Hot water usage for baths	26.4729	26.0733	25.5047	24.6534	23.8861	22.8298	22.0285	23.0084	23.5227	24.5692	25.6574	26.4519	(42b)
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
Average daily hot water use (litres/day)												122.5649	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.3229	130.4848	126.9794	122.3563	118.0655	112.6328	109.4664	114.5974	117.8884	123.2829	128.8415	133.2399	(44)
Energy conte	196.2743	172.6578	181.4510	159.8279	152.1393	130.2561	120.9636	134.8832	136.7447	158.8624	174.1336	195.6726	(45)
Energy content (annual)										Total = Sum(45)m =		1913.8664	
Distribution loss (46)m = 0.15 x (45)m	29.4411	25.8987	27.2176	23.9742	22.8209	19.5384	18.1445	20.2325	20.5117	23.8294	26.1200	29.3509	(46)
Water storage loss:													
Store volume												150.0000	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(64)
										Total per year (kWh/year) = Sum(64)m =		2542.5424	(64)
12Total per year (kWh/year)												2543	(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	107.9767	95.9905	103.0480	94.4804	93.3018	84.6477	82.9359	87.5642	86.8052	95.5373	99.2370	107.7766	(65)

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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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.0875	121.8826	110.0875	113.7571	110.0875	113.7571	110.0875	110.0875	113.7571	110.0875	113.7571	110.0875	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)	145.1300	142.8430	138.5053	131.2227	125.4057	117.5663	111.4730	117.6938	120.5628	128.4103	137.8292	144.8611	(72)
Total internal gains	517.5419	529.1453	507.7325	492.8788	469.2029	448.6972	430.0251	434.1506	445.9693	464.3878	491.6656	508.3638	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.3000	10.6334	0.4000	0.7000	0.7700	6.8089	(74)
East	6.3300	19.6403	0.4000	0.7000	0.7700	24.1236	(76)
South	1.5000	46.7521	0.4000	0.7000	0.7700	13.6077	(78)

Solar gains	44.5402	82.4889	128.2157	180.9457	220.1860	225.5911	214.6339	184.7557	146.6269	95.5226	54.6087	37.2726	(83)

Total gains	562.0821	611.6342	635.9482	673.8245	689.3889	674.2883	644.6590	618.9064	592.5962	559.9105	546.2742	545.6364	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	112.0434	112.3337	112.6255	114.1078	114.4089	115.9388	115.9388	116.2497	115.3219	114.4089	113.8082	113.2138	
alpha	8.4696	8.4889	8.5084	8.6072	8.6273	8.7293	8.7293	8.7500	8.6881	8.6273	8.5872	8.5476	
util living area													
	0.9843	0.9667	0.9275	0.8055	0.6275	0.4386	0.3155	0.3426	0.5399	0.8240	0.9575	0.9871	(86)
MIT	20.6225	20.7280	20.8459	20.9607	20.9952	20.9998	21.0000	21.0000	20.9989	20.9602	20.7974	20.6048	(87)
Th 2	20.3724	20.3740	20.3755	20.3831	20.3847	20.3923	20.3923	20.3939	20.3893	20.3847	20.3816	20.3785	(88)
util rest of house													
	0.9800	0.9583	0.9108	0.7738	0.5876	0.3970	0.2719	0.2975	0.4927	0.7877	0.9455	0.9835	(89)
MIT 2	20.0373	20.1400	20.2508	20.3555	20.3819	20.3922	20.3923	20.3938	20.3888	20.3580	20.2138	20.0256	(90)
Living area fraction										fLA = Living area / (4) =		0.3889	(91)
MIT	20.2649	20.3686	20.4822	20.5908	20.6204	20.6285	20.6286	20.6296	20.6260	20.5922	20.4407	20.2509	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2649	20.3686	20.4822	20.5908	20.6204	20.6285	20.6286	20.6296	20.6260	20.5922	20.4407	20.2509	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9792	0.9582	0.9139	0.7848	0.6029	0.4132	0.2889	0.3151	0.5111	0.8004	0.9468	0.9826	(94)
Useful gains	550.3714	586.0674	581.1858	528.8009	415.6635	278.6027	186.2261	194.9887	302.8477	448.1597	517.2099	536.1624	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	763.6555	738.0057	665.3603	549.0948	417.8723	278.6758	186.2287	194.9942	303.2880	468.0775	628.2377	759.8309	(97)
Space heating kWh													
	158.6834	102.1026	62.6258	14.6116	1.6433	0.0000	0.0000	0.0000	0.0000	14.8189	79.9400	166.4093	(98a)
Space heating requirement - total per year (kWh/year)												600.8348	
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													
	158.6834	102.1026	62.6258	14.6116	1.6433	0.0000	0.0000	0.0000	0.0000	14.8189	79.9400	166.4093	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												600.8348	
Space heating per m2											(98c) / (4) =	8.3449	(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 %)												219.3000	(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													
	158.6834	102.1026	62.6258	14.6116	1.6433	0.0000	0.0000	0.0000	0.0000	14.8189	79.9400	166.4093	(98)
Space heating efficiency (main heating system 1)													
	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)													
	72.3590	46.5584	28.5571	6.6628	0.7493	0.0000	0.0000	0.0000	0.0000	6.7573	36.4524	75.8821	(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													
	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(64)
Efficiency of water heater												190.4000	(216)
(217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(217)
Fuel for water heating, kWh/month													
	131.1285	116.0110	123.3432	111.0819	107.9484	95.5505	91.5746	98.8853	98.9583	111.4794	118.5954	130.8125	(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	18.8002	16.9808	18.8002	18.1937	18.8002	18.1937	18.8002	18.8002	18.1937	18.8002	18.1937	18.8002	(231)
Lighting	21.2844	17.0751	15.3743	11.2638	8.7005	7.1084	7.9369	10.3167	13.4004	17.5820	19.8588	21.8759	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-9.5962	-16.7308	-30.1175	-41.0495	-50.2467	-49.1047	-47.9983	-42.0467	-32.2006	-21.3390	-11.4036	-7.8646	(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	-1.5459	-4.1711	-11.0228	-21.1585	-32.0338	-33.8393	-32.9965	-25.2347	-15.4922	-6.9449	-2.2821	-1.1348	(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												273.9785	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												190.4000	
Water heating fuel used												1335.3689	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)													
mechanical ventilation fans (SFP = 0.8400)												221.3568	(230a)
Total electricity for the above, kWh/year												221.3568	(231)

Electricity for lighting (calculated in Appendix L)	171.7772	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-547.5548	(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	1454.9266	(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	273.9785	0.1586	43.4569	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1335.3689	0.1409	188.1116	(264)
Space and water heating			231.5684	(265)
Pumps, fans and electric keep-hot	221.3568	0.1387	30.7049	(267)
Energy for lighting	171.7772	0.1443	24.7928	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-359.6984	0.1310	-47.1158	
PV Unit electricity exported	-187.8565	0.1205	-22.6353	
Total			-69.7511	(269)
Total CO2, kg/year			217.3150	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	273.9785	1.5871	434.8433	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1335.3689	1.5209	2030.9338	(278)
Space and water heating			2465.7771	(279)
Pumps, fans and electric keep-hot	221.3568	1.5128	334.8686	(281)
Energy for lighting	171.7772	1.5338	263.4776	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-359.6984	1.4839	-533.7559	
PV Unit electricity exported	-187.8565	0.4420	-83.0360	
Total			-616.7920	(283)
Total Primary energy kWh/year			2447.3313	(286)
Dwelling Primary energy Rate (DPER)			33.9900	(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	72.0000 (1b)	x	3.0000 (2b)	=	216.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 72.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	216.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.1389	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3889	(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) =	0.3597	(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	0.4586	0.4497	0.4407	0.3957	0.3867	0.3417	0.3417	0.3327	0.3597	0.3867	0.4047	0.4227	(22b)

Effective ac	0.6052	0.6011	0.5971	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5893 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			11.1300	1.1450	12.7443			(27)
Heatloss Floor 1			20.0000	0.1300	2.6000			(28b)
South	24.0000	1.5000	22.5000	0.1800	4.0500			(29a)
North	24.0000	3.3000	20.7000	0.1800	3.7260			(29a)
East	28.0000	6.3300	21.6700	0.1800	3.9006			(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1800	4.6440			(29a)
Total net area of external elements Aum(A, m2)			124.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.8649			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			247.9708 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3 Sill	7.3000	0.0500	0.3650
E4 Jamb	16.0000	0.0500	0.8000
E20 Exposed floor (normal)	6.0000	0.3200	1.9200
E7 Party floor between dwellings (in blocks of flats)	100.0000	0.0700	7.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0000	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.6300 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	44.4949 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.1371	42.8460	42.5606	41.2203	40.9695	39.8022	39.8022	39.5860	40.2518	40.9695	41.4768	42.0072	(38)
Heat transfer coeff	87.6320	87.3408	87.0555	85.7152	85.4644	84.2970	84.2970	84.0809	84.7467	85.4644	85.9717	86.5021	(39)
Average = Sum(39)m / 12 =												85.7140	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2171	1.2131	1.2091	1.1905	1.1870	1.1708	1.1708	1.1678	1.1770	1.1870	1.1941	1.2014	(40)
HLP (average)												1.1905	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2937	(42)
Hot water usage for mixer showers													
	62.6772	61.7353	60.3627	57.7366	55.7986	53.6373	52.4088	53.7710	55.2642	57.5847	60.2673	62.4371	(42a)
Hot water usage for baths													
	27.0765	26.6744	26.1081	25.0640	24.2822	23.4152	22.9470	23.5093	24.1216	25.0492	26.1148	26.9849	(42b)
Hot water usage for other uses													
	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
Average daily hot water use (litres/day)												117.5446	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	127.8733	125.1431	121.8181	116.7617	112.6557	108.2413	106.5446	109.8552	113.3469	117.9812	123.1155	127.5416	(44)
Energy conte	202.5201	178.2021	187.2299	159.8409	151.6562	133.0953	128.8565	136.0237	139.7680	160.0994	175.4006	199.6994	(45)
Energy content (annual)										Total = Sum(45)m =		1952.3920	
Distribution loss (46)m = 0.15 x (45)m													
	30.3780	26.7303	28.0845	23.9761	22.7484	19.9643	19.3285	20.4036	20.9652	24.0149	26.3101	29.9549	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	249.1150	220.2878	233.8248	204.9327	198.2511	178.1872	175.4514	182.6186	184.8599	206.6943	220.4925	246.2943	(62)
WWHRS	-28.6534	-25.3413	-26.5360	-21.9728	-20.4779	-17.5231	-16.4251	-17.4664	-18.1300	-21.3733	-24.2134	-28.1228	(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													
	220.4616	194.9465	207.2888	182.9599	177.7732	160.6641	159.0263	165.1522	166.7298	185.3210	196.2791	218.1715	(64)
										Total per year (kWh/year) = Sum(64)m =		2234.7740	(64)
12Total per year (kWh/year)												2235	(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													
	104.6138	92.9208	99.5299	89.2206	87.7016	80.3277	80.1207	82.5038	82.5463	90.5090	94.3942	103.6760	(65)

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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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	106.9910	118.4543	106.9910	110.5574	106.9910	110.5574	106.9910	106.9910	110.5574	106.9910	110.5574	106.9910	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)													
	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)

Water heating gains (Table 5)

	140.6100	138.2750	133.7767	123.9175	117.8785	111.5662	107.6891	110.8922	114.6477	121.6518	131.1030	139.3494 (72)

Total internal gains

	509.9255	521.1490	499.9074	482.3739	458.5793	439.4975	423.1448	424.2526	436.8545	454.5329	481.7397	499.7557 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.3000	10.6334	0.6300	0.7000	0.7700	10.7240	(74)
East	6.3300	19.6403	0.6300	0.7000	0.7700	37.9947	(76)
South	1.5000	46.7521	0.6300	0.7000	0.7700	21.4321	(78)

Solar gains	70.1508	129.9200	201.9398	284.9894	346.7929	355.3059	338.0483	290.9903	230.9374	150.4481	86.0087	58.7043	(83)
Total gains	580.0762	651.0690	701.8471	767.3633	805.3722	794.8034	761.1931	715.2429	667.7919	604.9810	567.7484	558.4600	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.5937	56.7823	56.9685	57.8593	58.0290	58.8326	58.8326	58.9839	58.5205	58.0290	57.6866	57.3329	
alpha	4.7729	4.7855	4.7979	4.8573	4.8686	4.9222	4.9222	4.9323	4.9014	4.8686	4.8458	4.8222	
util living area	0.9927	0.9864	0.9725	0.9274	0.8241	0.6428	0.4799	0.5285	0.7711	0.9452	0.9856	0.9939	(86)
MIT	19.6861	19.8683	20.1406	20.5158	20.8048	20.9573	20.9916	20.9869	20.8959	20.5282	20.0554	19.6666	(87)
Th 2	19.9063	19.9096	19.9127	19.9276	19.9304	19.9434	19.9434	19.9459	19.9384	19.9304	19.9248	19.9189	(88)
util rest of house	0.9903	0.9820	0.9634	0.9030	0.7690	0.5512	0.3685	0.4136	0.6877	0.9216	0.9801	0.9919	(89)
MIT 2	18.3998	18.6330	18.9778	19.4461	19.7699	19.9198	19.9409	19.9414	19.8704	19.4723	18.8831	18.3840	(90)
Living area fraction									fLA = Living area / (4) =			0.3889	(91)
MIT	18.9000	19.1134	19.4300	19.8621	20.1724	20.3232	20.3495	20.3480	20.2692	19.8829	19.3390	18.8828	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9000	19.1134	19.4300	19.8621	20.1724	20.3232	20.3495	20.3480	20.2692	19.8829	19.3390	18.8828	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9873	0.9778	0.9583	0.9013	0.7827	0.5855	0.4120	0.4584	0.7159	0.9203	0.9762	0.9893	(94)
Useful gains	572.7301	636.6144	672.5575	691.6318	630.3411	465.3180	313.6155	327.8702	478.0604	556.7771	554.2322	552.4580	(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	1279.4287	1241.4077	1125.6273	939.6190	724.0861	482.4528	316.0720	331.9478	522.8206	793.3591	1052.2099	1270.0911	(97)
Space heating kWh	525.7838	406.4211	337.0839	178.5508	69.7463	0.0000	0.0000	0.0000	0.0000	176.0170	358.5439	533.9190	(98a)
Space heating requirement - total per year (kWh/year)												2586.0659	
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	525.7838	406.4211	337.0839	178.5508	69.7463	0.0000	0.0000	0.0000	0.0000	176.0170	358.5439	533.9190	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2586.0659	
Space heating per m2											(98c) / (4) =	35.9176	(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	525.7838	406.4211	337.0839	178.5508	69.7463	0.0000	0.0000	0.0000	0.0000	176.0170	358.5439	533.9190	(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)	569.6465	440.3263	365.2047	193.4461	75.5647	0.0000	0.0000	0.0000	0.0000	190.7010	388.4550	578.4605	(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	220.4616	194.9465	207.2888	182.9599	177.7732	160.6641	159.0263	165.1522	166.7298	185.3210	196.2791	218.1715	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9367	85.6679	85.1435	84.0051	82.1460	79.8000	79.8000	79.8000	79.8000	83.9444	85.3929	85.9868	(217)
Fuel for water heating, kWh/month	256.5395	227.5607	243.4583	217.7962	216.4113	201.3335	199.2810	206.9577	208.9346	220.7663	229.8540	253.7267	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.2306	17.8342	16.0577	11.7646	9.0873	7.4244	8.2897	10.7753	13.9961	18.3636	20.7417	22.8485	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.4748	-35.6060	-52.7941	-61.2938	-67.7684	-63.8665	-63.0909	-58.7425	-51.3386	-41.5854	-27.2987	-21.0338	(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	-10.6659	-22.7391	-45.7593	-69.5549	-92.7759	-93.5095	-92.4024	-77.8603	-56.5795	-32.7828	-14.3258	-8.4113	(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	2801.8048	(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	2682.6199	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	179.4138	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1186.2601	(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	4563.5784	(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	2801.8048	0.2100	588.3790	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2682.6199	0.2100	563.3502	(264)
Space and water heating			1151.7292	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	179.4138	0.1443	25.8950	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.8934	0.1339	-76.1900	
PV Unit electricity exported	-617.3667	0.1255	-77.5087	
Total			-153.6988	(269)
Total CO2, kg/year			1035.8546	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.3900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2801.8048	1.1300	3166.0395	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2682.6199	1.1300	3031.3604	(278)
Space and water heating			6197.3999	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	179.4138	1.5338	275.1909	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.8934	1.4949	-850.4577	
PV Unit electricity exported	-617.3667	0.4608	-284.5002	
Total			-1134.9579	(283)
Total Primary energy kWh/year			5467.7337	(286)
Target Primary Energy Rate (TPER)			75.9400	(287)

Summary for Input Data

elmhurst energy

Property Reference	1-T-N ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	1-T-N ASHP + PV	**Prop Type Ref**	1-T-N Gas
Property			

SAP Rating	83 B	**DER**	4.15	**TER**	17.41
Environmental	97 A	**% DER < TER**			76.16
CO_2 Emissions (t/year)	0.26	**DFEE**	51.41	**TFEE**	56.98
Compliance Check	See BREL	**% DFEE < TFEE**			9.77
% DPER < TPER	50.74	**DPER**	45.41	**TPER**	92.19

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Top-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	25.00 m	72.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	28.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	24.00	22.50	0.00	None	1.50	Enter Gross Area
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	24.00	20.70	0.00	None	3.30	Enter Gross Area
West	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	28.00	21.67	0.00	None	6.33	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	28.00	25.80	2.50	Stairwell Stairwell 2	2.20	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	93.00

10.0 External Roofs

Summary for Input Data

elmhurst energy

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	73.00	73.00	None	0.00	Enter Gross Area	0.00

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Concrete floor slab, carpeted	100.00	73.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
North	Window	North	North	1.50	0
Opening	Window	West	West	6.33	0
Opening	Window	South	South	3.30	0
Opening	Door	Wall to Common	North	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	8.50	0.05	0.05	No
E3 Sill	Independently assessed	7.30	0.05	0.05	No
E4 Jamb	Independently assessed	16.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	6.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	50.00	0.07	0.07	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	6.00	0.02	0.02	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Independently assessed	8.00	0.00	0.00	No
E15 Flat roof with parapet	Independently assessed	34.00	0.56	0.56	No

Y-value	0.15	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues	
21.0 Fixed Cooling System	No

Summary for Input Data

elmhurst energy

22.0 Lighting

No Fixed Lighting	No				
	Name	**Efficacy**	**Power**	**Capacity**	**Count**
	Lighting 1	100.00	9	900	12

24.0 Main Heating 1	SAP table	
Description	Default ASHP	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Electricity	
SAP Code	224	
In Winter	219.30	
In Summer	190.40	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2210	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	**Fuel Type**	**Heating Use**	**Efficiency**	**Percentage Of Heat**	**Heat**	**Heat Power Ratio**	**Electrical**	**Fuel Factor**	**Efficiency type**
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From header tank
Bath Count	1
Supplementary Immersion	No

Summary for Input Data

elmhurst energy

Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store	None

32.0 Photovoltaic Unit	One Dwelling	
Export Capable Meter?	Yes	
Connected To Dwelling	Yes	
Diverter	No	
Battery Capacity [kWh]	0.00	

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.90	South	Horizontal	Modest	No	No	0.80		

34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	1-T-N ASHP + PV	Issued on Date	05/02/2024
Assessment Reference	1-T-N ASHP + PV	Prop Type Ref	1-T-N Gas
Property			

SAP Rating	83 B	DER	4.15	TER	17.41
Environmental	97 A	% DER < TER			76.16
CO_2 Emissions (t/year)	0.26	DFEE	51.41	TFEE	56.98
Compliance Check	See BREL	% DFEE < TFEE			9.77
% DPER < TPER	50.74	DPER	45.41	TPER	92.19

Assessor Details	Mr. Andrew Sturt	Assessor ID	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	72.0000	(1b)	x 3.0000	(2b) =	216.0000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		216.0000	(5)

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2. Ventilation rate

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	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	0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		1.5000	(17)
Infiltration rate		0.0750	(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) =	0.0694	(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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		86.4000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			11.1300	0.8687	9.6689			(27)
Door			2.2000	1.1000	2.4200			(26)
North	24.0000	1.5000	22.5000	0.1400	3.1500	110.0000	2475.0000	(29a)
South	24.0000	3.3000	20.7000	0.1400	2.8980	110.0000	2277.0000	(29a)
West	28.0000	6.3300	21.6700	0.1400	3.0338	110.0000	2383.7000	(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1100	2.8380	14.0000	361.2000	(29a)
External Roof 1	73.0000		73.0000	0.1100	8.0300	9.0000	657.0000	(30)
Total net area of external elements Aum(A, m2)			177.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.0387			(33)
Party Floor 1			73.0000			80.0000	5840.0000	(32d)
Internal Wall 1			93.0000			9.0000	837.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 14830.9000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	205.9847	(35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E3 Sill	7.3000	0.0500	0.3650	
E4 Jamb	16.0000	0.0500	0.8000	
E20 Exposed floor (normal)	6.0000	0.3200	1.9200	
E7 Party floor between dwellings (in blocks of flats)	50.0000	0.0700	3.5000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0000	0.0000	0.0000	
E15 Flat roof with parapet	34.0000	0.5600	19.0400	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			26.1700	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	58.2087	(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	11.1520	11.0284	10.9047	10.2866	10.1630	9.5448	9.5448	9.4212	9.7921	10.1630	10.4102	10.6575	(38)
Heat transfer coeff	69.3607	69.2371	69.1134	68.4953	68.3717	67.7536	67.7536	67.6299	68.0008	68.3717	68.6189	68.8662	(39)
Average = Sum(39)m / 12 =												68.4644	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9633	0.9616	0.9599	0.9513	0.9496	0.9410	0.9410	0.9393	0.9445	0.9496	0.9530	0.9565	(40)
HLP (average)												0.9509	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2937	(42)
Hot water usage for mixer showers	68.7304	67.6781	66.1274	63.7418	61.6044	58.6142	56.2491	59.0140	60.4047	63.3663	66.4507	68.6684	(42a)
Hot water usage for baths	26.4729	26.0733	25.5047	24.6534	23.8861	22.8298	22.0285	23.0084	23.5227	24.5692	25.6574	26.4519	(42b)
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
Average daily hot water use (litres/day)												122.5649	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.3229	130.4848	126.9794	122.3563	118.0655	112.6328	109.4664	114.5974	117.8884	123.2829	128.8415	133.2399	(44)
Energy conte	196.2743	172.6578	181.4510	159.8279	152.1393	130.2561	120.9636	134.8832	136.7447	158.8624	174.1336	195.6726	(45)
Energy content (annual)										Total = Sum(45)m =		1913.8664	
Distribution loss (46)m = 0.15 x (45)m	29.4411	25.8987	27.2176	23.9742	22.8209	19.5384	18.1445	20.2325	20.5117	23.8294	26.1200	29.3509	(46)
Water storage loss:													
Store volume												150.0000	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(64)
										Total per year (kWh/year) = Sum(64)m =		2542.5424	(64)
12Total per year (kWh/year)												2543	(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	107.9767	95.9905	103.0480	94.4804	93.3018	84.6477	82.9359	87.5642	86.8052	95.5373	99.2370	107.7766	(65)

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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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.0875	121.8826	110.0875	113.7571	110.0875	113.7571	110.0875	110.0875	113.7571	110.0875	113.7571	110.0875	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)	145.1300	142.8430	138.5053	131.2227	125.4057	117.5663	111.4730	117.6938	120.5628	128.4103	137.8292	144.8611	(72)
Total internal gains	517.5419	529.1453	507.7325	492.8788	469.2029	448.6972	430.0251	434.1506	445.9693	464.3878	491.6656	508.3638	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.5000	10.6334	0.4000	0.7000	0.7700	3.0950	(74)
South	3.3000	46.7521	0.4000	0.7000	0.7700	29.9368	(78)
West	6.3300	19.6403	0.4000	0.7000	0.7700	24.1236	(80)

Solar gains	57.1554	102.1344	150.2211	200.0753	234.2111	236.2656	226.2770	200.6994	167.7122	115.9188	69.3827	48.2864	(83)

Total gains	574.6973	631.2796	657.9536	692.9541	703.4141	684.9629	656.3021	634.8500	613.6814	580.3066	561.0483	556.6502	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.3952	59.5013	59.6077	60.1456	60.2544	60.8041	60.8041	60.9153	60.5830	60.2544	60.0373	59.8217	
alpha	4.9597	4.9668	4.9738	5.0097	5.0170	5.0536	5.0536	5.0610	5.0389	5.0170	5.0025	4.9881	
util living area	0.9842	0.9734	0.9539	0.8986	0.7891	0.6085	0.4496	0.4832	0.7066	0.9060	0.9698	0.9863	(86)
MIT	19.9327	20.0989	20.3251	20.6278	20.8540	20.9695	20.9945	20.9921	20.9356	20.6653	20.2606	19.9037	(87)
Th 2	20.1140	20.1154	20.1169	20.1241	20.1255	20.1328	20.1328	20.1342	20.1299	20.1255	20.1226	20.1198	(88)
util rest of house	0.9803	0.9669	0.9425	0.8737	0.7411	0.5352	0.3633	0.3955	0.6363	0.8780	0.9614	0.9830	(89)
MIT 2	19.1533	19.3173	19.5384	19.8292	20.0266	20.1178	20.1311	20.1316	20.0945	19.8694	19.4833	19.1294	(90)
Living area fraction										fLA = Living area / (4) =		0.3889	(91)
MIT	19.4564	19.6212	19.8444	20.1398	20.3484	20.4490	20.4669	20.4663	20.4216	20.1789	19.7856	19.4305	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4564	19.6212	19.8444	20.1398	20.3484	20.4490	20.4669	20.4663	20.4216	20.1789	19.7856	19.4305	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9767	0.9626	0.9384	0.8742	0.7541	0.5626	0.3969	0.4296	0.6610	0.8799	0.9575	0.9796	(94)
Useful gains	561.2971	607.6746	617.4067	605.7917	530.4541	385.3805	260.4683	272.7275	405.6344	510.6095	537.1799	545.3134	(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	1051.2592	1019.2562	922.2745	769.8708	591.3061	396.2915	261.9933	275.0009	429.8754	654.9280	870.4725	1048.8664	(97)
Space heating kWh	364.5318	276.5828	226.8217	118.1369	45.2739	0.0000	0.0000	0.0000	0.0000	107.3730	239.9707	374.6434	(98a)
Space heating requirement - total per year (kWh/year)												1753.3341	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	364.5318	276.5828	226.8217	118.1369	45.2739	0.0000	0.0000	0.0000	0.0000	107.3730	239.9707	374.6434	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1753.3341	
Space heating per m2											(98c) / (4) =	24.3519	(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 %)												219.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	364.5318	276.5828	226.8217	118.1369	45.2739	0.0000	0.0000	0.0000	0.0000	107.3730	239.9707	374.6434	(98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)	166.2252	126.1208	103.4299	53.8700	20.6447	0.0000	0.0000	0.0000	0.0000	48.9617	109.4258	170.8360	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(64)
Efficiency of water heater												190.4000	(216)
(217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(217)
Fuel for water heating, kWh/month	131.1285	116.0110	123.3432	111.0819	107.9484	95.5505	91.5746	98.8853	98.9583	111.4794	118.5954	130.8125	(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	18.8002	16.9808	18.8002	18.1937	18.8002	18.1937	18.8002	18.8002	18.1937	18.8002	18.1937	18.8002	(231)
Lighting	21.2844	17.0751	15.3743	11.2638	8.7005	7.1084	7.9369	10.3167	13.4004	17.5820	19.8588	21.8759	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-9.7209	-17.0519	-30.8759	-42.0900	-50.9499	-49.1047	-47.9983	-42.0467	-32.2006	-21.6766	-11.5746	-7.9587	(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	-1.4212	-3.8500	-10.2643	-20.1180	-31.3306	-33.8393	-32.9965	-25.2347	-15.4922	-6.6073	-2.1112	-1.0407	(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												799.5140	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												190.4000	
Water heating fuel used												1335.3689	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)													
mechanical ventilation fans (SFP = 0.8400)												221.3568	(230a)
Total electricity for the above, kWh/year												221.3568	(231)

Electricity for lighting (calculated in Appendix L)	171.7772	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-547.5548	(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	1980.4621	(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	799.5140	0.1558	124.5557	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1335.3689	0.1409	188.1116	(264)
Space and water heating			312.6672	(265)
Pumps, fans and electric keep-hot	221.3568	0.1387	30.7049	(267)
Energy for lighting	171.7772	0.1443	24.7928	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-363.2490	0.1311	-47.6322	
PV Unit electricity exported	-184.3058	0.1198	-22.0732	
Total			-69.7055	(269)
Total CO2, kg/year			298.4594	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1500	(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	799.5140	1.5768	1260.6456	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1335.3689	1.5209	2030.9338	(278)
Space and water heating			3291.5794	(279)
Pumps, fans and electric keep-hot	221.3568	1.5128	334.8686	(281)
Energy for lighting	171.7772	1.5338	263.4776	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-363.2490	1.4844	-539.2192	
PV Unit electricity exported	-184.3058	0.4393	-80.9605	
Total			-620.1797	(283)
Total Primary energy kWh/year			3269.7459	(286)
Dwelling Primary energy Rate (DPER)			45.4100	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	72.0000 (1b)	x	3.0000 (2b)	=	216.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 72.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	216.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.1389	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3889	(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) =	0.3597	(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	0.4586	0.4497	0.4407	0.3957	0.3867	0.3417	0.3417	0.3327	0.3597	0.3867	0.4047	0.4227	(22b)

Effective ac	0.6052	0.6011	0.5971	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5893 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			11.1300	1.1450	12.7443			(27)
North	24.0000	1.5000	22.5000	0.1800	4.0500			(29a)
South	24.0000	3.3000	20.7000	0.1800	3.7260			(29a)
West	28.0000	6.3300	21.6700	0.1800	3.9006			(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1800	4.6440			(29a)
External Roof 1	73.0000		73.0000	0.1100	8.0300			(30)
Total net area of external elements Aum(A, m2)			177.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.2949			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				205.9847 (35)
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E3 Sill	7.3000	0.0500	0.3650	
E4 Jamb	16.0000	0.0500	0.8000	
E20 Exposed floor (normal)	6.0000	0.3200	1.9200	
E7 Party floor between dwellings (in blocks of flats)	50.0000	0.0700	3.5000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0000	0.0000	0.0000	
E15 Flat roof with parapet	34.0000	0.5600	19.0400	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				26.1700 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	65.4649 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.1371	42.8460	42.5606	41.2203	40.9695	39.8022	39.8022	39.5860	40.2518	40.9695	41.4768	42.0072	(38)
Heat transfer coeff	108.6020	108.3108	108.0255	106.6852	106.4344	105.2670	105.2670	105.0509	105.7167	106.4344	106.9417	107.4721	(39)
Average = Sum(39)m / 12 =												106.6840	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5084	1.5043	1.5004	1.4817	1.4783	1.4620	1.4620	1.4590	1.4683	1.4783	1.4853	1.4927	(40)
HLP (average)												1.4817	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2937 (42)
Hot water usage for mixer showers	62.6772	61.7353	60.3627	57.7366	55.7986	53.6373	52.4088	53.7710	55.2642	57.5847	60.2673	62.4371 (42a)
Hot water usage for baths	27.0765	26.6744	26.1081	25.0640	24.2822	23.4152	22.9470	23.5093	24.1216	25.0492	26.1148	26.9849 (42b)
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196 (42c)
Average daily hot water use (litres/day)												117.5446 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.8733	125.1431	121.8181	116.7617	112.6557	108.2413	106.5446	109.8552	113.3469	117.9812	123.1155	127.5416	(44)
Energy conte	202.5201	178.2021	187.2299	159.8409	151.6562	133.0953	128.8565	136.0237	139.7680	160.0994	175.4006	199.6994	(45)
Energy content (annual)										Total = Sum(45)m =		1952.3920	
Distribution loss (46)m = 0.15 x (45)m	30.3780	26.7303	28.0845	23.9761	22.7484	19.9643	19.3285	20.4036	20.9652	24.0149	26.3101	29.9549	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.1150	220.2878	233.8248	204.9327	198.2511	178.1872	175.4514	182.6186	184.8599	206.6943	220.4925	246.2943	(62)
WWHRS	-28.6534	-25.3413	-26.5360	-21.9728	-20.4779	-17.5231	-16.4251	-17.4664	-18.1300	-21.3733	-24.2134	-28.1228	(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	220.4616	194.9465	207.2888	182.9599	177.7732	160.6641	159.0263	165.1522	166.7298	185.3210	196.2791	218.1715	(64)
										Total per year (kWh/year) = Sum(64)m =		2234.7740	(64)
12Total per year (kWh/year)												2235	(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	104.6138	92.9208	99.5299	89.2206	87.7016	80.3277	80.1207	82.5038	82.5463	90.5090	94.3942	103.6760	(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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.9910	118.4543	106.9910	110.5574	106.9910	110.5574	106.9910	106.9910	110.5574	106.9910	110.5574	106.9910	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)													

	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)													
	140.6100	138.2750	133.7767	123.9175	117.8785	111.5662	107.6891	110.8922	114.6477	121.6518	131.1030	139.3494	(72)
Total internal gains													
	509.9255	521.1490	499.9074	482.3739	458.5793	439.4975	423.1448	424.2526	436.8545	454.5329	481.7397	499.7557	(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	1.5000	10.6334	0.6300	0.7000	0.7700	4.8746	(74)
South	3.3000	46.7521	0.6300	0.7000	0.7700	47.1505	(78)
West	6.3300	19.6403	0.6300	0.7000	0.7700	37.9947	(80)

Solar gains	90.0198	160.8616	236.5982	315.1185	368.8825	372.1184	356.3862	316.1015	264.1466	182.5720	109.2778	76.0510	(83)
Total gains	599.9452	682.0106	736.5056	797.4924	827.4618	811.6159	779.5310	740.3541	701.0012	637.1049	591.0175	575.8067	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.9339	38.0358	38.1363	38.6154	38.7064	39.1357	39.1357	39.2162	38.9692	38.7064	38.5228	38.3327	
alpha	3.5289	3.5357	3.5424	3.5744	3.5804	3.6090	3.6090	3.6144	3.5979	3.5804	3.5682	3.5555	
util living area													
	0.9864	0.9777	0.9622	0.9232	0.8457	0.7051	0.5537	0.5963	0.7978	0.9362	0.9772	0.9882	(86)
MIT	19.0357	19.2671	19.6189	20.1036	20.5310	20.8354	20.9488	20.9322	20.7242	20.1744	19.5321	19.0060	(87)
Th 2	19.6812	19.6843	19.6872	19.7012	19.7038	19.7161	19.7161	19.7184	19.7114	19.7038	19.6985	19.6930	(88)
util rest of house													
	0.9826	0.9713	0.9509	0.8985	0.7929	0.6037	0.4099	0.4540	0.7131	0.9106	0.9696	0.9849	(89)
MIT 2	17.4513	17.7459	18.1908	18.7976	19.2975	19.6150	19.6984	19.6923	19.5173	18.8969	18.0940	17.4210	(90)
Living area fraction									fLA = Living area / (4) =			0.3889	(91)
MIT	18.0674	18.3375	18.7462	19.3055	19.7772	20.0896	20.1846	20.1745	19.9866	19.3937	18.6533	18.0373	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0674	18.3375	18.7462	19.3055	19.7772	20.0896	20.1846	20.1745	19.9866	19.3937	18.6533	18.0373	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9757	0.9624	0.9401	0.8893	0.7964	0.6359	0.4652	0.5080	0.7337	0.9027	0.9611	0.9787	(94)
Useful gains	585.3954	656.3400	692.4196	709.1828	658.9599	516.1231	362.6290	376.0939	514.3534	575.1393	568.0308	563.5528	(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													
	1495.1703	1455.4276	1322.9013	1110.1080	859.6928	577.8710	377.3433	396.5148	622.3159	935.9568	1235.5283	1487.1277	(97)
Space heating kWh													
	676.8725	536.9869	469.0784	288.6661	149.3453	0.0000	0.0000	0.0000	0.0000	268.4482	480.5982	687.1398	(98a)
Space heating requirement - total per year (kWh/year)												3557.1354	
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													
	676.8725	536.9869	469.0784	288.6661	149.3453	0.0000	0.0000	0.0000	0.0000	268.4482	480.5982	687.1398	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3557.1354	
Space heating per m2											(98c) / (4) =	49.4047	(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													
	676.8725	536.9869	469.0784	288.6661	149.3453	0.0000	0.0000	0.0000	0.0000	268.4482	480.5982	687.1398	(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)													
	733.3396	581.7843	508.2107	312.7477	161.8043	0.0000	0.0000	0.0000	0.0000	290.8431	520.6915	744.4634	(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													
	220.4616	194.9465	207.2888	182.9599	177.7732	160.6641	159.0263	165.1522	166.7298	185.3210	196.2791	218.1715	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.4058	86.2103	85.8332	85.0777	83.6716	79.8000	79.8000	79.8000	79.8000	84.8899	85.9878	86.4503	(217)
Fuel for water heating, kWh/month													
	255.1467	226.1289	241.5019	215.0504	212.4653	201.3335	199.2810	206.9577	208.9346	218.3074	228.2638	252.3663	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.2306	17.8342	16.0577	11.7646	9.0873	7.4244	8.2897	10.7753	13.9961	18.3636	20.7417	22.8485	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.4748	-35.6060	-52.7941	-61.2938	-67.7684	-63.8665	-63.0909	-58.7425	-51.3386	-41.5854	-27.2987	-21.0338	(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	-10.6659	-22.7391	-45.7593	-69.5549	-92.7759	-93.5095	-92.4024	-77.8603	-56.5795	-32.7828	-14.3258	-8.4113	(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	3853.8845	(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	2665.7376	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	179.4138	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1186.2601	(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	5598.7758	(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	3853.8845	0.2100	809.3157	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2665.7376	0.2100	559.8049	(264)
Space and water heating			1369.1206	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	179.4138	0.1443	25.8950	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.8934	0.1339	-76.1900	
PV Unit electricity exported	-617.3667	0.1255	-77.5087	
Total			-153.6988	(269)
Total CO2, kg/year			1253.2461	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.4100	(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	3853.8845	1.1300	4354.8895	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2665.7376	1.1300	3012.2834	(278)
Space and water heating			7367.1729	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	179.4138	1.5338	275.1909	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.8934	1.4949	-850.4577	
PV Unit electricity exported	-617.3667	0.4608	-284.5002	
Total			-1134.9579	(283)
Total Primary energy kWh/year			6637.5068	(286)
Target Primary Energy Rate (TPER)			92.1900	(287)

Summary for Input Data

elmhurst energy

Property Reference	1-T-S ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	1-T-S ASHP + PV	**Prop Type Ref**	1-T-S Gas
Property			

SAP Rating	83 B	**DER**	4.20	**TER**	17.70
Environmental	97 A	**% DER < TER**			76.27
CO_2 Emissions (t/year)	0.26	**DFEE**	52.33	**TFEE**	58.33
Compliance Check	See BREL	**% DFEE < TFEE**			10.28
% DPER < TPER	50.94	**DPER**	45.99	**TPER**	93.75

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Top-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	25.00 m	72.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	28.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	24.00	22.50	0.00	None	1.50	Enter Gross Area
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	24.00	20.70	0.00	None	3.30	Enter Gross Area
East	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	28.00	21.67	0.00	None	6.33	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	28.00	25.80	2.50	Stairwell Stairwell 2	2.20	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	93.00

10.0 External Roofs

Summary for Input Data

elmhurst energy

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	73.00	73.00	None	0.00	Enter Gross Area	0.00

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Concrete floor slab, carpeted	100.00	73.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
South	Window	South	South	1.50	0
East	Window	East	East	6.33	0
North	Window	North	North	3.30	0
Opening	Door	Wall to Common	North	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	8.50	0.05	0.05	No
E3 Sill	Independently assessed	7.30	0.05	0.05	No
E4 Jamb	Independently assessed	16.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	6.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	50.00	0.07	0.07	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	6.00	0.02	0.02	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Independently assessed	8.00	0.00	0.00	No
E15 Flat roof with parapet	Independently assessed	34.00	0.56	0.56	No

Y-value	0.15	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues	
21.0 Fixed Cooling System	No

Summary for Input Data

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22.0 Lighting

No Fixed Lighting	No				
	Name	**Efficacy**	**Power**	**Capacity**	**Count**
	Lighting 1	100.00	9	900	12

24.0 Main Heating 1	SAP table	
Description	Default ASHP	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Electricity	
SAP Code	224	
In Winter	219.30	
In Summer	190.40	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2210	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	**Fuel Type**	**Heating Use**	**Efficiency**	**Percentage Of Heat**	**Heat**	**Heat Power Ratio**	**Electrical**	**Fuel Factor**	**Efficiency type**
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From header tank
Bath Count	1
Supplementary Immersion	No

Summary for Input Data

elmhurst energy

Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store	None

32.0 Photovoltaic Unit	One Dwelling	
Export Capable Meter?	Yes	
Connected To Dwelling	Yes	
Diverter	No	
Battery Capacity [kWh]	0.00	

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.90	South	Horizontal	Modest	No	No	0.80		

34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	1-T-S ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	1-T-S ASHP + PV	**Prop Type Ref**	1-T-S Gas
Property			

SAP Rating	83 B	**DER**	4.20	**TER**	17.70
Environmental	97 A	**% DER < TER**			76.27
CO_2 Emissions (t/year)	0.26	**DFEE**	52.33	**TFEE**	58.33
Compliance Check	See BREL	**% DFEE < TFEE**			10.28
% DPER < TPER	50.94	**DPER**	45.99	**TPER**	93.75

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	72.0000	(1b)	x 3.0000	(2b) =	216.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		216.0000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		1.5000	(17)
Infiltration rate		0.0750	(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) =	0.0694	(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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		86.4000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(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	
Window (Uw = 0.90)			11.1300	0.8687	9.6689			(27)
Door			2.2000	1.1000	2.4200			(26)
South	24.0000	1.5000	22.5000	0.1400	3.1500	110.0000	2475.0000	(29a)
North	24.0000	3.3000	20.7000	0.1400	2.8980	110.0000	2277.0000	(29a)
East	28.0000	6.3300	21.6700	0.1400	3.0338	110.0000	2383.7000	(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1100	2.8380	14.0000	361.2000	(29a)
External Roof 1	73.0000		73.0000	0.1100	8.0300	9.0000	657.0000	(30)
Total net area of external elements Aum(A, m2)			177.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.0387			(33)
Party Floor 1			73.0000			80.0000	5840.0000	(32d)
Internal Wall 1			93.0000			9.0000	837.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14830.9000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		205.9847 (35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E3 Sill	7.3000	0.0500	0.3650	
E4 Jamb	16.0000	0.0500	0.8000	
E20 Exposed floor (normal)	6.0000	0.3200	1.9200	
E7 Party floor between dwellings (in blocks of flats)	50.0000	0.0700	3.5000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0000	0.0000	0.0000	
E15 Flat roof with parapet	34.0000	0.5600	19.0400	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			26.1700	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	58.2087	(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	11.1520	11.0284	10.9047	10.2866	10.1630	9.5448	9.5448	9.4212	9.7921	10.1630	10.4102	10.6575	(38)
Heat transfer coeff	69.3607	69.2371	69.1134	68.4953	68.3717	67.7536	67.7536	67.6299	68.0008	68.3717	68.6189	68.8662	(39)
Average = Sum(39)m / 12 =												68.4644	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9633	0.9616	0.9599	0.9513	0.9496	0.9410	0.9410	0.9393	0.9445	0.9496	0.9530	0.9565	(40)
HLP (average)												0.9509	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2937	(42)
Hot water usage for mixer showers	68.7304	67.6781	66.1274	63.7418	61.6044	58.6142	56.2491	59.0140	60.4047	63.3663	66.4507	68.6684	(42a)
Hot water usage for baths	26.4729	26.0733	25.5047	24.6534	23.8861	22.8298	22.0285	23.0084	23.5227	24.5692	25.6574	26.4519	(42b)
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
Average daily hot water use (litres/day)												122.5649	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.3229	130.4848	126.9794	122.3563	118.0655	112.6328	109.4664	114.5974	117.8884	123.2829	128.8415	133.2399	(44)
Energy conte	196.2743	172.6578	181.4510	159.8279	152.1393	130.2561	120.9636	134.8832	136.7447	158.8624	174.1336	195.6726	(45)
Energy content (annual)										Total = Sum(45)m =		1913.8664	
Distribution loss (46)m = 0.15 x (45)m	29.4411	25.8987	27.2176	23.9742	22.8209	19.5384	18.1445	20.2325	20.5117	23.8294	26.1200	29.3509	(46)
Water storage loss:													
Store volume												150.0000	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(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	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(64)
										Total per year (kWh/year) = Sum(64)m =		2542.5424	(64)
12Total per year (kWh/year)												2543	(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	107.9767	95.9905	103.0480	94.4804	93.3018	84.6477	82.9359	87.5642	86.8052	95.5373	99.2370	107.7766	(65)

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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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.0875	121.8826	110.0875	113.7571	110.0875	113.7571	110.0875	110.0875	113.7571	110.0875	113.7571	110.0875	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)	145.1300	142.8430	138.5053	131.2227	125.4057	117.5663	111.4730	117.6938	120.5628	128.4103	137.8292	144.8611	(72)
Total internal gains	517.5419	529.1453	507.7325	492.8788	469.2029	448.6972	430.0251	434.1506	445.9693	464.3878	491.6656	508.3638	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.3000	10.6334	0.4000	0.7000	0.7700	6.8089	(74)
East	6.3300	19.6403	0.4000	0.7000	0.7700	24.1236	(76)
South	1.5000	46.7521	0.4000	0.7000	0.7700	13.6077	(78)

Solar gains	44.5402	82.4889	128.2157	180.9457	220.1860	225.5911	214.6339	184.7557	146.6269	95.5226	54.6087	37.2726	(83)

Total gains	562.0821	611.6342	635.9482	673.8245	689.3889	674.2883	644.6590	618.9064	592.5962	559.9105	546.2742	545.6364	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.3952	59.5013	59.6077	60.1456	60.2544	60.8041	60.8041	60.9153	60.5830	60.2544	60.0373	59.8217	
alpha	4.9597	4.9668	4.9738	5.0097	5.0170	5.0536	5.0536	5.0610	5.0389	5.0170	5.0025	4.9881	
util living area													
	0.9855	0.9764	0.9593	0.9069	0.7984	0.6166	0.4573	0.4948	0.7245	0.9160	0.9727	0.9874	(86)
MIT	19.9117	20.0678	20.2934	20.6069	20.8456	20.9677	20.9941	20.9912	20.9279	20.6420	20.2376	19.8852	(87)
Th 2	20.1140	20.1154	20.1169	20.1241	20.1255	20.1328	20.1328	20.1342	20.1299	20.1255	20.1226	20.1198	(88)
util rest of house													
	0.9820	0.9707	0.9489	0.8834	0.7512	0.5429	0.3697	0.4055	0.6546	0.8900	0.9650	0.9843	(89)
MIT 2	19.1328	19.2872	19.5084	19.8108	20.0204	20.1168	20.1309	20.1313	20.0898	19.8492	19.4613	19.1112	(90)
Living area fraction										fLA = Living area / (4) =		0.3889	(91)
MIT	19.4357	19.5908	19.8137	20.1204	20.3413	20.4477	20.4666	20.4657	20.4158	20.1575	19.7632	19.4122	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4357	19.5908	19.8137	20.1204	20.3413	20.4477	20.4666	20.4657	20.4158	20.1575	19.7632	19.4122	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9785	0.9665	0.9447	0.8833	0.7636	0.5704	0.4038	0.4402	0.6788	0.8911	0.9612	0.9811	(94)
Useful gains	550.0081	591.1509	600.8063	595.1783	526.4138	384.6163	260.3265	272.4293	402.2353	498.9125	525.0699	535.3300	(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													
	1049.8216	1017.1467	920.1553	768.5432	590.8211	396.2030	261.9760	274.9649	429.4766	653.4651	868.9367	1047.6039	(97)
Space heating kWh													
	371.8613	286.2691	237.5957	124.8227	47.9190	0.0000	0.0000	0.0000	0.0000	114.9872	247.5841	381.1318	(98a)
Space heating requirement - total per year (kWh/year)												1812.1709	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	371.8613	286.2691	237.5957	124.8227	47.9190	0.0000	0.0000	0.0000	0.0000	114.9872	247.5841	381.1318	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1812.1709	
Space heating per m2											(98c) / (4) =	25.1690	(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 %)												219.3000	(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													
	371.8613	286.2691	237.5957	124.8227	47.9190	0.0000	0.0000	0.0000	0.0000	114.9872	247.5841	381.1318	(98)
Space heating efficiency (main heating system 1)													
	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)													
	169.5674	130.5377	108.3428	56.9187	21.8509	0.0000	0.0000	0.0000	0.0000	52.4337	112.8975	173.7947	(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													
	249.6687	220.8850	234.8454	211.4999	205.5337	181.9281	174.3580	188.2776	188.4167	212.2568	225.8056	249.0670	(64)
Efficiency of water heater												190.4000	(216)
(217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(217)
Fuel for water heating, kWh/month													
	131.1285	116.0110	123.3432	111.0819	107.9484	95.5505	91.5746	98.8853	98.9583	111.4794	118.5954	130.8125	(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	18.8002	16.9808	18.8002	18.1937	18.8002	18.1937	18.8002	18.8002	18.1937	18.8002	18.1937	18.8002	(231)
Lighting	21.2844	17.0751	15.3743	11.2638	8.7005	7.1084	7.9369	10.3167	13.4004	17.5820	19.8588	21.8759	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-9.7248	-17.0676	-30.9203	-42.1518	-50.9909	-49.1047	-47.9983	-42.0467	-32.2006	-21.7022	-11.5818	-7.9613	(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	-1.4173	-3.8343	-10.2200	-20.0562	-31.2895	-33.8393	-32.9965	-25.2347	-15.4922	-6.5817	-2.1040	-1.0381	(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												826.3433	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												190.4000	
Water heating fuel used												1335.3689	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)													
mechanical ventilation fans (SFP = 0.8400)												221.3568	(230a)
Total electricity for the above, kWh/year												221.3568	(231)

Electricity for lighting (calculated in Appendix L)	171.7772	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-547.5548	(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	2007.2914	(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	826.3433	0.1557	128.6327	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1335.3689	0.1409	188.1116	(264)
Space and water heating			316.7442	(265)
Pumps, fans and electric keep-hot	221.3568	0.1387	30.7049	(267)
Energy for lighting	171.7772	0.1443	24.7928	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-363.4511	0.1311	-47.6614	
PV Unit electricity exported	-184.1037	0.1197	-22.0417	
Total			-69.7031	(269)
Total CO2, kg/year			302.5388	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.2000	(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	826.3433	1.5763	1302.5741	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1335.3689	1.5209	2030.9338	(278)
Space and water heating			3333.5079	(279)
Pumps, fans and electric keep-hot	221.3568	1.5128	334.8686	(281)
Energy for lighting	171.7772	1.5338	263.4776	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-363.4511	1.4845	-539.5293	
PV Unit electricity exported	-184.1037	0.4391	-80.8441	
Total			-620.3734	(283)
Total Primary energy kWh/year			3311.4807	(286)
Dwelling Primary energy Rate (DPER)			45.9900	(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	72.0000 (1b)	x	3.0000 (2b)	=	216.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 72.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	216.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.1389	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3889	(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) =	0.3597	(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	0.4586	0.4497	0.4407	0.3957	0.3867	0.3417	0.3417	0.3327	0.3597	0.3867	0.4047	0.4227	(22b)

Effective ac	0.6052	0.6011	0.5971	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5893 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			11.1300	1.1450	12.7443			(27)
South	24.0000	1.5000	22.5000	0.1800	4.0500			(29a)
North	24.0000	3.3000	20.7000	0.1800	3.7260			(29a)
East	28.0000	6.3300	21.6700	0.1800	3.9006			(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1800	4.6440			(29a)
External Roof 1	73.0000		73.0000	0.1100	8.0300			(30)
Total net area of external elements Aum(A, m2)			177.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.2949			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K				205.9847 (35)
List of Thermal Bridges				
K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250	
E3 Sill	7.3000	0.0500	0.3650	
E4 Jamb	16.0000	0.0500	0.8000	
E20 Exposed floor (normal)	6.0000	0.3200	1.9200	
E7 Party floor between dwellings (in blocks of flats)	50.0000	0.0700	3.5000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0000	0.0000	0.0000	
E15 Flat roof with parapet	34.0000	0.5600	19.0400	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				26.1700 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	65.4649 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.1371	42.8460	42.5606	41.2203	40.9695	39.8022	39.8022	39.5860	40.2518	40.9695	41.4768	42.0072	(38)
Heat transfer coeff	108.6020	108.3108	108.0255	106.6852	106.4344	105.2670	105.2670	105.0509	105.7167	106.4344	106.9417	107.4721	(39)
Average = Sum(39)m / 12 =												106.6840	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5084	1.5043	1.5004	1.4817	1.4783	1.4620	1.4620	1.4590	1.4683	1.4783	1.4853	1.4927	(40)
HLP (average)												1.4817	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2937	(42)
Hot water usage for mixer showers	62.6772	61.7353	60.3627	57.7366	55.7986	53.6373	52.4088	53.7710	55.2642	57.5847	60.2673	62.4371	(42a)
Hot water usage for baths	27.0765	26.6744	26.1081	25.0640	24.2822	23.4152	22.9470	23.5093	24.1216	25.0492	26.1148	26.9849	(42b)
Hot water usage for other uses	38.1196	36.7335	35.3473	33.9611	32.5749	31.1888	31.1888	32.5749	33.9611	35.3473	36.7335	38.1196	(42c)
Average daily hot water use (litres/day)												117.5446	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.8733	125.1431	121.8181	116.7617	112.6557	108.2413	106.5446	109.8552	113.3469	117.9812	123.1155	127.5416	(44)
Energy conte	202.5201	178.2021	187.2299	159.8409	151.6562	133.0953	128.8565	136.0237	139.7680	160.0994	175.4006	199.6994	(45)
Energy content (annual)										Total = Sum(45)m =		1952.3920	
Distribution loss (46)m = 0.15 x (45)m	30.3780	26.7303	28.0845	23.9761	22.7484	19.9643	19.3285	20.4036	20.9652	24.0149	26.3101	29.9549	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	249.1150	220.2878	233.8248	204.9327	198.2511	178.1872	175.4514	182.6186	184.8599	206.6943	220.4925	246.2943	(62)
WWHRS	-28.6534	-25.3413	-26.5360	-21.9728	-20.4779	-17.5231	-16.4251	-17.4664	-18.1300	-21.3733	-24.2134	-28.1228	(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	220.4616	194.9465	207.2888	182.9599	177.7732	160.6641	159.0263	165.1522	166.7298	185.3210	196.2791	218.1715	(64)
										Total per year (kWh/year) = Sum(64)m =		2234.7740	(64)
12Total per year (kWh/year)												2235	(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	104.6138	92.9208	99.5299	89.2206	87.7016	80.3277	80.1207	82.5038	82.5463	90.5090	94.3942	103.6760	(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	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	114.6842	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.9910	118.4543	106.9910	110.5574	106.9910	110.5574	106.9910	106.9910	110.5574	106.9910	110.5574	106.9910	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9192	204.0145	198.7344	187.4938	173.3045	159.9686	151.0594	148.9641	154.2442	165.4848	179.6741	193.0100	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	34.4684	(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)													

	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	-91.7474	(71)
Water heating gains (Table 5)													
	140.6100	138.2750	133.7767	123.9175	117.8785	111.5662	107.6891	110.8922	114.6477	121.6518	131.1030	139.3494	(72)
Total internal gains													
	509.9255	521.1490	499.9074	482.3739	458.5793	439.4975	423.1448	424.2526	436.8545	454.5329	481.7397	499.7557	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.3000	10.6334	0.6300	0.7000	0.7700	10.7240	(74)
East	6.3300	19.6403	0.6300	0.7000	0.7700	37.9947	(76)
South	1.5000	46.7521	0.6300	0.7000	0.7700	21.4321	(78)

Solar gains	70.1508	129.9200	201.9398	284.9894	346.7929	355.3059	338.0483	290.9903	230.9374	150.4481	86.0087	58.7043	(83)
Total gains	580.0762	651.0690	701.8471	767.3633	805.3722	794.8034	761.1931	715.2429	667.7919	604.9810	567.7484	558.4600	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.9339	38.0358	38.1363	38.6154	38.7064	39.1357	39.1357	39.2162	38.9692	38.7064	38.5228	38.3327	
alpha	3.5289	3.5357	3.5424	3.5744	3.5804	3.6090	3.6090	3.6144	3.5979	3.5804	3.5682	3.5555	
util living area													
	0.9878	0.9805	0.9670	0.9304	0.8543	0.7143	0.5644	0.6121	0.8157	0.9444	0.9798	0.9893	(86)
MIT	19.0054	19.2215	19.5707	20.0675	20.5119	20.8280	20.9455	20.9262	20.7006	20.1338	19.4977	18.9793	(87)
Th 2	19.6812	19.6843	19.6872	19.7012	19.7038	19.7161	19.7161	19.7184	19.7114	19.7038	19.6985	19.6930	(88)
util rest of house													
	0.9842	0.9749	0.9569	0.9075	0.8031	0.6133	0.4189	0.4681	0.7340	0.9214	0.9730	0.9862	(89)
MIT 2	17.4130	17.6888	18.1315	18.7557	19.2782	19.6097	19.6971	19.6896	19.4971	18.8498	18.0512	17.3872	(90)
Living area fraction									fLA = Living area / (4) =			0.3889	(91)
MIT	18.0323	18.2848	18.6912	19.2658	19.7580	20.0835	20.1826	20.1705	19.9651	19.3491	18.6138	18.0063	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0323	18.2848	18.6912	19.2658	19.7580	20.0835	20.1826	20.1705	19.9651	19.3491	18.6138	18.0063	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9779	0.9666	0.9467	0.8979	0.8056	0.6450	0.4748	0.5226	0.7526	0.9132	0.9649	0.9805	(94)
Useful gains	567.2401	629.3350	664.4346	689.0190	648.7801	512.6211	361.4224	373.7570	502.5824	552.4485	547.8488	547.5426	(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													
	1491.3534	1449.7201	1316.9602	1105.8810	857.6446	577.2274	377.1266	396.0965	620.0429	931.2067	1231.3014	1483.7937	(97)
Space heating kWh													
	687.5403	551.2988	485.4790	300.1406	155.3952	0.0000	0.0000	0.0000	0.0000	281.7961	492.0859	696.5708	(98a)
Space heating requirement - total per year (kWh/year)												3650.3067	
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													
	687.5403	551.2988	485.4790	300.1406	155.3952	0.0000	0.0000	0.0000	0.0000	281.7961	492.0859	696.5708	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3650.3067	
Space heating per m2											(98c) / (4) =	50.6987	(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													
	687.5403	551.2988	485.4790	300.1406	155.3952	0.0000	0.0000	0.0000	0.0000	281.7961	492.0859	696.5708	(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)													
	744.8974	597.2901	525.9794	325.1794	168.3588	0.0000	0.0000	0.0000	0.0000	305.3046	533.1375	754.6813	(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													
	220.4616	194.9465	207.2888	182.9599	177.7732	160.6641	159.0263	165.1522	166.7298	185.3210	196.2791	218.1715	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.4332	86.2586	85.9011	85.1625	83.7595	79.8000	79.8000	79.8000	79.8000	84.9969	86.0333	86.4739	(217)
Fuel for water heating, kWh/month													
	255.0659	226.0024	241.3109	214.8363	212.2425	201.3335	199.2810	206.9577	208.9346	218.0327	228.1432	252.2974	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.2306	17.8342	16.0577	11.7646	9.0873	7.4244	8.2897	10.7753	13.9961	18.3636	20.7417	22.8485	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.4748	-35.6060	-52.7941	-61.2938	-67.7684	-63.8665	-63.0909	-58.7425	-51.3386	-41.5854	-27.2987	-21.0338	(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	-10.6659	-22.7391	-45.7593	-69.5549	-92.7759	-93.5095	-92.4024	-77.8603	-56.5795	-32.7828	-14.3258	-8.4113	(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	3954.8285	(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	2664.4382	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	179.4138	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1186.2601	(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	5698.4203	(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	3954.8285	0.2100	830.5140	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2664.4382	0.2100	559.5320	(264)
Space and water heating			1390.0460	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	179.4138	0.1443	25.8950	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.8934	0.1339	-76.1900	
PV Unit electricity exported	-617.3667	0.1255	-77.5087	
Total			-153.6988	(269)
Total CO2, kg/year			1274.1714	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.7000	(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	3954.8285	1.1300	4468.9562	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2664.4382	1.1300	3010.8151	(278)
Space and water heating			7479.7713	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	179.4138	1.5338	275.1909	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.8934	1.4949	-850.4577	
PV Unit electricity exported	-617.3667	0.4608	-284.5002	
Total			-1134.9579	(283)
Total Primary energy kWh/year			6750.1051	(286)
Target Primary Energy Rate (TPER)			93.7500	(287)

Summary for Input Data

elmhurst energy

Property Reference	2-G-N ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	2-G-N_ASHP + PV	**Prop Type Ref**	2-G-N Gas
Property			

SAP Rating	85 B	**DER**	3.55	**TER**	15.73
Environmental	97 A	**% DER < TER**			77.43
CO_2 Emissions (t/year)	0.24	**DFEE**	43.78	**TFEE**	51.01
Compliance Check	See BREL	**% DFEE < TFEE**			14.18
% DPER < TPER	52.93	**DPER**	39.13	**TPER**	83.13

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	28.00 m	78.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	28.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	29.00	22.80	0.00	None	6.20	Enter Gross Area
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	29.00	25.86	0.00	None	3.14	Enter Gross Area
East	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	28.00	22.50	0.00	None	5.50	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	28.00	28.00	2.50	Stairwell Stairwell 2	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	90.00

10.0 External Roofs

Summary for Input Data

elmhurst energy

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	6.00	6.00	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling	Concrete floor slab, carpeted	100.00	78.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Exposed Floor - Solid	Lowest occupied	Other	0.11	None	0.00	0.00	78.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
North	Window	North	North	6.20	0
East	Window	East	East	3.30	0
South	Window	South	South	3.14	0
Door	Door	East	East	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	10.00	0.05	0.05	No
E3 Sill	Independently assessed	8.00	0.05	0.05	No
E4 Jamb	Independently assessed	20.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	28.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	25.00	0.07	0.07	No
P7 Party Wall - Exposed floor (normal)	Independently assessed	9.30	0.16	0.16	No
E16 Corner (normal)	Independently assessed	9.00	0.09	0.09	No
E18 Party wall between dwellings	Independently assessed	6.00	0.06	0.06	No

Y-value	0.08	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
19.0 Mechanical Ventilation		
Mechanical Ventilation		
Mechanical Ventilation System Present	Yes	
Approved Installation	No	
Mechanical Ventilation data Type	Database	
Type	Balanced mechanical ventilation with heat recovery	
MV Reference Number	500480	
Configuration	1	
Manufacturer SFP	0.60	
Duct Type	Rigid	
MVHR Efficiency	96.00	
Wet Rooms	1	
SFP from Installer Commissioning Certificate	No	
MVHR System Location	Inside heated envelope (installed exclusively)	
Duct Installation Specification	Level 1	
20.0 Fans, Open Fireplaces, Flues		

Summary for Input Data

elmhurst energy

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	SAP table	
Description	Default ASHP	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Electricity	
SAP Code	224	
In Winter	219.30	
In Summer	190.40	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2210	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From header tank
Bath Count	1

Summary for Input Data

Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
32.0 Photovoltaic Unit	One Dwelling	
Export Capable Meter?	Yes	
Connected To Dwelling	Yes	
Diverter	No	
Battery Capacity [kWh]	0.00	

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.90	South	Horizontal	Modest	No	No	0.80		

34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	2-G-N ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	2-G-N_ASHP + PV	**Prop Type Ref**	2-G-N Gas
Property			

SAP Rating	85 B	**DER**	3.55	**TER**	15.73
Environmental	97 A	**% DER < TER**			77.43
CO_2 Emissions (t/year)	0.24	**DFEE**	43.78	**TFEE**	51.01
Compliance Check	See BREL	**% DFEE < TFEE**			14.18
% DPER < TPER	52.93	**DPER**	39.13	**TPER**	83.13

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	78.0000 (1b)	x	3.0000 (2b)	=	234.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	234.0000	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		1.5000	(17)
Infiltration rate		0.0750	(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) =	0.0694	(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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		86.4000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(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	
Window (Uw = 0.90)			12.6400	0.8687	10.9807			(27)
Door			2.2000	1.1000	2.4200			(26)
Heatloss Floor 1			78.0000	0.1100	8.5800			(28b)
North	29.0000	6.2000	22.8000	0.1400	3.1920	110.0000	2508.0000	(29a)
South	29.0000	3.1400	25.8600	0.1400	3.6204	110.0000	2844.6000	(29a)
East	28.0000	5.5000	22.5000	0.1400	3.1500	110.0000	2475.0000	(29a)
Wall to Common	28.0000		28.0000	0.1100	3.0800	14.0000	392.0000	(29a)
External Roof 1	6.0000		6.0000	0.1100	0.6600	9.0000	54.0000	(30)
Total net area of external elements Aum(A, m2)			198.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.6831			(33)
Party Ceiling			78.0000			100.0000	7800.0000	(32b)
Internal Wall 1			90.0000			9.0000	810.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16883.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		216.4564 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	10.0000	0.0500	0.5000	
E3 Sill	8.0000	0.0500	0.4000	
E4 Jamb	20.0000	0.0500	1.0000	
E20 Exposed floor (normal)	28.0000	0.3200	8.9600	
E7 Party floor between dwellings (in blocks of flats)	25.0000	0.0700	1.7500	
P7 Party Wall - Exposed floor (normal)	9.3000	0.1600	1.4880	
E16 Corner (normal)	9.0000	0.0900	0.8100	
E18 Party wall between dwellings	6.0000	0.0600	0.3600	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			15.2680	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	50.9511	(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	12.0813	11.9474	11.8135	11.1438	11.0099	10.3402	10.3402	10.2063	10.6081	11.0099	11.2777	11.5456	(38)
Heat transfer coeff	63.0324	62.8985	62.7645	62.0949	61.9610	61.2913	61.2913	61.1574	61.5592	61.9610	62.2288	62.4967	(39)
Average = Sum(39)m / 12 =												62.0614	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8081	0.8064	0.8047	0.7961	0.7944	0.7858	0.7858	0.7841	0.7892	0.7944	0.7978	0.8012	(40)
HLP (average)												0.7957	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Assumed occupancy												2.4238	(42)
Hot water usage for mixer showers	71.1230	70.0342	68.4294	65.9608	63.7490	60.6547	58.2073	61.0684	62.5075	65.5723	68.7640	71.0589	(42a)
Hot water usage for baths	27.3903	26.9768	26.3886	25.5077	24.7138	23.6210	22.7919	23.8057	24.3378	25.4207	26.5465	27.3685	(42b)
Hot water usage for other uses	39.4523	38.0177	36.5831	35.1484	33.7138	32.2792	32.2792	33.7138	35.1484	36.5831	38.0177	39.4523	(42c)
Average daily hot water use (litres/day)												126.8329	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.9656	135.0286	131.4011	126.6169	122.1766	116.5548	113.2783	118.5879	121.9937	127.5760	133.3281	137.8798	(44)
Energy conte	203.1092	178.6702	187.7694	165.3934	157.4369	134.7918	125.1759	139.5802	141.5066	164.3945	180.1974	202.4865	(45)
Energy content (annual)											Total = Sum(45)m =	1980.5120	
Distribution loss (46)m = 0.15 x (45)m	30.4664	26.8005	28.1654	24.8090	23.6155	20.2188	18.7764	20.9370	21.2260	24.6592	27.0296	30.3730	(46)
Water storage loss:													
Store volume												150.0000	(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	256.5036	226.8974	241.1638	217.0654	210.8313	186.4638	178.5703	192.9746	193.1786	217.7889	231.8694	255.8809	(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	256.5036	226.8974	241.1638	217.0654	210.8313	186.4638	178.5703	192.9746	193.1786	217.7889	231.8694	255.8809	(64)
										Total per year (kWh/year) = Sum(64)m =		2609.1880	(64)
12Total per year (kWh/year)												2609	(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	110.2493	97.9896	105.1489	96.3309	95.0633	86.1559	84.3365	89.1259	88.3885	97.3767	101.2532	110.0423	(65)

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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	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.1312	128.5739	116.1312	120.0023	116.1312	120.0023	116.1312	116.1312	120.0023	116.1312	120.0023	116.1312	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.2098	217.4430	211.8154	199.8349	184.7117	170.4980	161.0024	158.7692	164.3968	176.3773	191.5005	205.7142	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	(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)	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	(71)
Water heating gains (Table 5)	148.1846	145.8178	141.3291	133.7929	127.7733	119.6609	113.3555	119.7929	122.7619	130.8827	140.6295	147.9063	(72)
Total internal gains	541.8829	554.1920	531.6330	515.9874	490.9734	469.5184	449.8464	454.0506	466.5182	485.7484	514.4895	532.1090	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.2000	10.6334	0.4000	0.7000	0.7700	12.7925	(74)
East	3.3000	19.6403	0.4000	0.7000	0.7700	12.5763	(76)
South	3.1400	46.7521	0.4000	0.7000	0.7700	28.4854	(78)

Solar gains	53.8541	95.7007	141.4833	192.9806	232.2928	237.7130	226.2259	195.8109	159.1454	108.6115	65.2272	45.6205	(83)
Total gains	595.7370	649.8927	673.1164	708.9679	723.2662	707.2314	676.0722	649.8615	625.6636	594.3599	579.7167	577.7295	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.4044	74.5628	74.7219	75.5278	75.6910	76.5180	76.5180	76.6855	76.1850	75.6910	75.3652	75.0422	
alpha	5.9603	5.9709	5.9815	6.0352	6.0461	6.1012	6.1012	6.1124	6.0790	6.0461	6.0243	6.0028	
util living area	0.9851	0.9734	0.9512	0.8815	0.7454	0.5478	0.3980	0.4314	0.6568	0.8903	0.9685	0.9873	(86)
MIT	20.2303	20.3718	20.5538	20.7906	20.9384	20.9919	20.9990	20.9984	20.9770	20.8090	20.4973	20.2064	(87)
Th 2	20.2463	20.2478	20.2493	20.2567	20.2582	20.2657	20.2657	20.2672	20.2627	20.2582	20.2552	20.2523	(88)
util rest of house	0.9815	0.9671	0.9396	0.8556	0.6994	0.4877	0.3321	0.3635	0.5946	0.8610	0.9600	0.9842	(89)
MIT 2	19.5516	19.6910	19.8680	20.0933	20.2178	20.2618	20.2654	20.2666	20.2505	20.1145	19.8211	19.5330	(90)
Living area fraction										fLA = Living area / (4) =		0.3590	(91)
MIT	19.7952	19.9354	20.1142	20.3436	20.4765	20.5239	20.5287	20.5293	20.5113	20.3638	20.0638	19.7747	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7952	19.9354	20.1142	20.3436	20.4765	20.5239	20.5287	20.5293	20.5113	20.3638	20.0638	19.7747	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9788	0.9641	0.9372	0.8588	0.7135	0.5091	0.3557	0.3879	0.6161	0.8656	0.9574	0.9818	(94)
Useful gains	583.1304	626.5380	630.8310	608.8870	516.0165	360.0334	240.5116	252.0602	385.4691	514.4530	555.0078	567.2052	(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	976.7006	945.7021	854.4893	710.5901	543.7988	363.0840	240.7969	252.5390	394.6745	604.9758	806.7237	973.3690	(97)
Space heating kWh	292.8163	214.4782	166.4018	73.2263	20.6700	0.0000	0.0000	0.0000	0.0000	67.3489	181.2354	302.1858	(98a)
Space heating requirement - total per year (kWh/year)												1318.3628	
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	292.8163	214.4782	166.4018	73.2263	20.6700	0.0000	0.0000	0.0000	0.0000	67.3489	181.2354	302.1858	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1318.3628	
Space heating per m2										(98c) / (4) =		16.9021	(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 %)	219.3000	(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	292.8163	214.4782	166.4018	73.2263	20.6700	0.0000	0.0000	0.0000	0.0000	67.3489	181.2354	302.1858	(98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)	133.5231	97.8013	75.8786	33.3909	9.4255	0.0000	0.0000	0.0000	0.0000	30.7109	82.6427	137.7956	(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	256.5036	226.8974	241.1638	217.0654	210.8313	186.4638	178.5703	192.9746	193.1786	217.7889	231.8694	255.8809	(64)
Efficiency of water heater												190.4000	(216)
(217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(217)
Fuel for water heating, kWh/month	134.7183	119.1688	126.6617	114.0049	110.7307	97.9326	93.7869	101.3522	101.4594	114.3850	121.7802	134.3912	(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	20.3668	18.3959	20.3668	19.7099	20.3668	19.7099	20.3668	20.3668	19.7099	20.3668	19.7099	20.3668	(231)
Lighting	22.4529	18.0125	16.2183	11.8822	9.1782	7.4986	8.3726	10.8831	14.1360	18.5472	20.9491	23.0769	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-9.7075	-17.0191	-30.8119	-42.0520	-51.1720	-49.7600	-48.6367	-42.5445	-32.5197	-21.6736	-11.5578	-7.9479	(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	-1.4346	-3.8828	-10.3283	-20.1560	-31.1084	-33.1840	-32.3581	-24.7369	-15.1731	-6.6103	-2.1280	-1.0515	(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	601.1686	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	190.4000	
Water heating fuel used	1370.3719	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)

mechanical ventilation fans (SFP = 0.8400) 239.8032 (230a)

Total electricity for the above, kWh/year	239.8032	(231)
Electricity for lighting (calculated in Appendix L)	181.2077	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-547.5548	(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	1844.9966	(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	601.1686	0.1566	94.1574	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1370.3719	0.1409	193.0672	(264)
Space and water heating			287.2245	(265)
Pumps, fans and electric keep-hot	239.8032	0.1387	33.2637	(267)
Energy for lighting	181.2077	0.1443	26.1539	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-365.4027	0.1310	-47.8783	
PV Unit electricity exported	-182.1521	0.1200	-21.8663	
Total			-69.7446	(269)
Total CO2, kg/year			276.8975	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5500	(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	601.1686	1.5798	949.7536	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1370.3719	1.5209	2084.2619	(278)
Space and water heating			3034.0156	(279)
Pumps, fans and electric keep-hot	239.8032	1.5128	362.7743	(281)
Energy for lighting	181.2077	1.5338	277.9425	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-365.4027	1.4841	-542.2791	
PV Unit electricity exported	-182.1521	0.4403	-80.2074	
Total			-622.4865	(283)
Total Primary energy kWh/year			3052.2458	(286)
Dwelling Primary energy Rate (DPER)			39.1300	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		78.0000 (1b)	x	3.0000 (2b)	=	234.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	234.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.1282	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3782	(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) =	0.3498	(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													

	0.4460	0.4373	0.4286	0.3848	0.3761	0.3323	0.3323	0.3236	0.3498	0.3761	0.3936	0.4111	(22b)
Effective ac	0.5995	0.5956	0.5918	0.5740	0.5707	0.5552	0.5552	0.5524	0.5612	0.5707	0.5774	0.5845	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			12.6400	1.1450	14.4733			(27)
Heatloss Floor 1			78.0000	0.1300	10.1400			(28b)
North	29.0000	6.2000	22.8000	0.1800	4.1040			(29a)
South	29.0000	3.1400	25.8600	0.1800	4.6548			(29a)
East	28.0000	5.5000	22.5000	0.1800	4.0500			(29a)
Wall to Common	28.0000		28.0000	0.1800	5.0400			(29a)
External Roof 1	6.0000		6.0000	0.1100	0.6600			(30)
Total net area of external elements Aum(A, m2)			198.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		45.3221			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 196.4564 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.0000	0.0500	0.5000
E3 Sill	8.0000	0.0500	0.4000
E4 Jamb	20.0000	0.0500	1.0000
E20 Exposed floor (normal)	28.0000	0.3200	8.9600
E7 Party floor between dwellings (in blocks of flats)	25.0000	0.0700	1.7500
P7 Party Wall - Exposed floor (normal)	9.3000	0.1600	1.4880
E16 Corner (normal)	9.0000	0.0900	0.8100
E18 Party wall between dwellings	6.0000	0.0600	0.3600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.2680 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 60.5901 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2917	45.9934	45.7010	44.3277	44.0708	42.8747	42.8747	42.6532	43.3354	44.0708	44.5906	45.1340	(38)
Heat transfer coeff	106.8818	106.5835	106.2911	104.9178	104.6609	103.4648	103.4648	103.2432	103.9255	104.6609	105.1807	105.7241	(39)

Average = Sum(39)m / 12 = 104.9166

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3703	1.3665	1.3627	1.3451	1.3418	1.3265	1.3265	1.3236	1.3324	1.3418	1.3485	1.3554	(40)
HLP (average)												1.3451	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4238 (42)

Hot water usage for mixer showers												
64.8591	63.8844	62.4641	59.7465	57.7410	55.5045	54.2333	55.6429	57.1881	59.5894	62.3653	64.6106	(42a)
Hot water usage for baths												
28.0148	27.5987	27.0128	25.9325	25.1236	24.2267	23.7422	24.3240	24.9575	25.9172	27.0198	27.9201	(42b)
Hot water usage for other uses												
39.4523	38.0177	36.5831	35.1484	33.7138	32.2792	32.2792	33.7138	35.1484	36.5831	38.0177	39.4523	(42c)

Average daily hot water use (litres/day) 121.6378 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	132.3262	129.5008	126.0600	120.8275	116.5785	112.0104	110.2546	113.6807	117.2939	122.0897	127.4028	131.9830	(44)
Energy conte	209.5724	184.4075	193.7495	165.4068	156.9370	137.7298	133.3434	140.7604	144.6352	165.6745	181.5086	206.6535	(45)
Energy content (annual)										Total = Sum(45)m =		2020.3786	
Distribution loss (46)m = 0.15 x (45)m													
	31.4359	27.6611	29.0624	24.8110	23.5406	20.6595	20.0015	21.1141	21.6953	24.8512	27.2263	30.9980	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	256.1673	226.4932	240.3444	210.4986	203.5319	182.8217	179.9383	187.3553	189.7270	212.2694	226.6004	253.2484	(62)
WWHRS	-29.6509	-26.2235	-27.4597	-22.7377	-21.1908	-18.1331	-16.9969	-18.0745	-18.7612	-22.1174	-25.0563	-29.1018	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	226.5164	200.2697	212.8846	187.7609	182.3412	164.6886	162.9415	169.2808	170.9658	190.1521	201.5441	224.1466	(64)
										Total per year (kWh/year) = Sum(64)m =		2293.4923	(64)
12Total per year (kWh/year)												2293	(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													
	106.9587	94.9841	101.6976	91.0712	89.4575	81.8686	81.6126	84.0788	84.1647	92.3627	96.4251	105.9882	(65)

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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	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	112.9645	125.0678	112.9645	116.7300	112.9645	116.7300	112.9645	112.9645	116.7300	112.9645	116.7300	112.9645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	215.2098	217.4430	211.8154	199.8349	184.7117	170.4980	161.0024	158.7692	164.3968	176.3773	191.5005	205.7142	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	(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)													
	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	(71)
Water heating gains (Table 5)													
	143.7618	141.3453	136.6904	126.4878	120.2385	113.7064	109.6944	113.0091	116.8954	124.1434	133.9237	142.4573	(72)
Total internal gains													
	534.2933	546.2134	523.8275	505.4100	480.2720	460.2917	443.0185	444.1000	457.3794	475.8424	504.5115	523.4932	(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	6.2000	10.6334	0.6300	0.7000	0.7700	20.1482	(74)
East	3.3000	19.6403	0.6300	0.7000	0.7700	19.8077	(76)
South	3.1400	46.7521	0.6300	0.7000	0.7700	44.8644	(78)

Solar gains	84.8203	150.7285	222.8363	303.9444	365.8611	374.3980	356.3058	308.4022	250.6541	171.0631	102.7328	71.8524	(83)
Total gains	619.1136	696.9420	746.6638	809.3544	846.1331	834.6896	799.3243	752.5022	708.0334	646.9055	607.2443	595.3456	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.8249	39.9363	40.0462	40.5704	40.6700	41.1402	41.1402	41.2284	40.9578	40.6700	40.4690	40.2610	
alpha	3.6550	3.6624	3.6697	3.7047	3.7113	3.7427	3.7427	3.7486	3.7305	3.7113	3.6979	3.6841	
util living area													
	0.9863	0.9778	0.9627	0.9223	0.8391	0.6899	0.5375	0.5844	0.7936	0.9356	0.9769	0.9881	(86)
MIT	19.1467	19.3660	19.7000	20.1701	20.5819	20.8625	20.9592	20.9440	20.7531	20.2328	19.6226	19.1194	(87)
Th 2	19.7862	19.7891	19.7920	19.8057	19.8082	19.8202	19.8202	19.8224	19.8156	19.8082	19.8031	19.7977	(88)
util rest of house													
	0.9826	0.9718	0.9522	0.8990	0.7889	0.5958	0.4075	0.4545	0.7146	0.9116	0.9697	0.9849	(89)
MIT 2	17.6662	17.9456	18.3684	18.9576	19.4393	19.7327	19.8049	19.7992	19.6358	19.0463	18.2828	17.6389	(90)
Living area fraction									fLA = Living area / (4) =			0.3590	(91)
MIT	18.1977	18.4555	18.8464	19.3929	19.8495	20.1382	20.2193	20.2101	20.0369	19.4722	18.7638	18.1703	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1977	18.4555	18.8464	19.3929	19.8495	20.1382	20.2193	20.2101	20.0369	19.4722	18.7638	18.1703	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9758	0.9629	0.9414	0.8892	0.7909	0.6232	0.4535	0.4998	0.7313	0.9030	0.9611	0.9787	(94)
Useful gains	604.1212	671.0949	702.8869	719.7003	669.1941	520.1854	362.4853	376.0735	517.7787	584.1715	583.6102	582.6657	(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													
	1485.4066	1444.7878	1312.3104	1100.8899	852.9290	573.0128	374.4668	393.3713	616.9944	928.5725	1226.8032	1476.9995	(97)
Space heating kWh													
	655.6763	519.9216	453.4111	274.4565	136.6987	0.0000	0.0000	0.0000	0.0000	256.2343	463.0990	665.3844	(98a)
Space heating requirement - total per year (kWh/year)												3424.8818	
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													
	655.6763	519.9216	453.4111	274.4565	136.6987	0.0000	0.0000	0.0000	0.0000	256.2343	463.0990	665.3844	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3424.8818	
Space heating per m2										(98c) / (4) =		43.9087	(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													
	655.6763	519.9216	453.4111	274.4565	136.6987	0.0000	0.0000	0.0000	0.0000	256.2343	463.0990	665.3844	(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)													
	710.3752	563.2953	491.2363	297.3526	148.1026	0.0000	0.0000	0.0000	0.0000	277.6103	501.7323	720.8931	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	226.5164	200.2697	212.8846	187.7609	182.3412	164.6886	162.9415	169.2808	170.9658	190.1521	201.5441	224.1466	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3009	86.0997	85.7114	84.9099	83.4227	79.8000	79.8000	79.8000	79.8000	84.7294	85.8635	86.3461	(217)
Fuel for water heating, kWh/month													
	262.4730	232.6020	248.3737	221.1295	218.5750	206.3767	204.1873	212.1314	214.2429	224.4229	234.7262	259.5908	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	23.4718	18.8299	16.9543	12.4214	9.5947	7.8389	8.7526	11.3769	14.7775	19.3889	21.8997	24.1241	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.4082	-38.3633	-56.7994	-65.8408	-72.7003	-68.4715	-67.6299	-63.0084	-55.1352	-44.7495	-29.4322	-22.7009	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

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

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

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

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

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

(233b)m	-11.6609	-24.8439	-49.9667	-75.9120	-101.2227	-102.0192	-100.8212	-84.9779	-61.7760	-35.8160	-15.6611	-9.1980	(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	3710.5979	(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	2738.8312	(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)	189.4308	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1285.1151	(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	5439.7447	(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	3710.5979	0.2100	779.2256	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2738.8312	0.2100	575.1546	(264)
Space and water heating			1354.3801	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	189.4308	0.1443	27.3407	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-611.2397	0.1340	-81.8820	
PV Unit electricity exported	-673.8755	0.1256	-84.6115	
Total			-166.4936	(269)
Total CO2, kg/year			1227.1565	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.7300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3710.5979	1.1300	4192.9756	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2738.8312	1.1300	3094.8793	(278)
Space and water heating			7287.8549	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	189.4308	1.5338	290.5553	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-611.2397	1.4951	-913.8402	
PV Unit electricity exported	-673.8755	0.4609	-310.5717	
Total			-1224.4120	(283)
Total Primary energy kWh/year			6484.0990	(286)
Target Primary Energy Rate (TPER)			83.1300	(287)

Summary for Input Data

elmhurst energy

Property Reference	2-G-S ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	2-G-S ASHP + PV	**Prop Type Ref**	2-G-S Gas
Property			

SAP Rating	85 B	**DER**	3.47	**TER**	15.29
Environmental	97 A	**% DER < TER**			77.31
CO_2 Emissions (t/year)	0.24	**DFEE**	42.38	**TFEE**	48.96
Compliance Check	See BREL	**% DFEE < TFEE**			13.45
% DPER < TPER	52.57	**DPER**	38.30	**TPER**	80.75

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	28.00 m	78.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	28.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	29.00	22.80	0.00	None	6.20	Enter Gross Area
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	29.00	25.86	0.00	None	3.14	Enter Gross Area
West	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	28.00	22.50	0.00	None	5.50	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	28.00	28.00	2.50	Stairwell Stairwell 2	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	90.00

10.0 External Roofs

Summary for Input Data

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	6.00	6.00	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling	Concrete floor slab, carpeted	100.00	78.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Exposed Floor - Solid	Lowest occupied	Other	0.11	None	0.00	0.00	78.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
South	Window	South	South	6.20	0
West	Window	West	West	3.30	0
North	Window	North	North	3.14	0
Door	Door	West	East	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	10.00	0.05	0.05	No
E3 Sill	Independently assessed	8.00	0.05	0.05	No
E4 Jamb	Independently assessed	20.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	28.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	25.00	0.07	0.07	No
P7 Party Wall - Exposed floor (normal)	Independently assessed	9.30	0.16	0.16	No
E16 Corner (normal)	Independently assessed	9.00	0.09	0.09	No
E18 Party wall between dwellings	Independently assessed	6.00	0.06	0.06	No

Y-value	0.08	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
19.0 Mechanical Ventilation		
Mechanical Ventilation		
Mechanical Ventilation System Present	Yes	
Approved Installation	No	
Mechanical Ventilation data Type	Database	
Type	Balanced mechanical ventilation with heat recovery	
MV Reference Number	500480	
Configuration	1	
Manufacturer SFP	0.60	
Duct Type	Rigid	
MVHR Efficiency	96.00	
Wet Rooms	1	
SFP from Installer Commissioning Certificate	No	
MVHR System Location	Inside heated envelope (installed exclusively)	
Duct Installation Specification	Level 1	

20.0 Fans, Open Fireplaces, Flues

Summary for Input Data

elmhurst energy

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	SAP table	
Description	Default ASHP	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Electricity	
SAP Code	224	
In Winter	219.30	
In Summer	190.40	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2210	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From header tank
Bath Count	1

Summary for Input Data

Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
32.0 Photovoltaic Unit	One Dwelling	
Export Capable Meter?	Yes	
Connected To Dwelling	Yes	
Diverter	No	
Battery Capacity [kWh]	0.00	

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.90	South	Horizontal	Modest	No	No	0.80		

34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	2-G-S ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	2-G-S ASHP + PV	**Prop Type Ref**	2-G-S Gas
Property			

SAP Rating	85 B	**DER**	3.47	**TER**	15.29
Environmental	97 A	**% DER < TER**			77.31
CO_2 Emissions (t/year)	0.24	**DFEE**	42.38	**TFEE**	48.96
Compliance Check	See BREL	**% DFEE < TFEE**			13.45
% DPER < TPER	52.57	**DPER**	38.30	**TPER**	80.75

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	78.0000 (1b)	x	3.0000 (2b)	=	234.0000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.0000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	234.0000	(5)

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2. Ventilation rate

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	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	0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		1.5000	(17)
Infiltration rate		0.0750	(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) =	0.0694	(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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		86.4000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			12.6400	0.8687	10.9807			(27)
Door			2.2000	1.1000	2.4200			(26)
Heatloss Floor 1			78.0000	0.1100	8.5800			(28b)
South	29.0000	6.2000	22.8000	0.1400	3.1920	110.0000	2508.0000	(29a)
North	29.0000	3.1400	25.8600	0.1400	3.6204	110.0000	2844.6000	(29a)
West	28.0000	5.5000	22.5000	0.1400	3.1500	110.0000	2475.0000	(29a)
Wall to Common	28.0000		28.0000	0.1100	3.0800	14.0000	392.0000	(29a)
External Roof 1	6.0000		6.0000	0.1100	0.6600	9.0000	54.0000	(30)
Total net area of external elements Aum(A, m2)			198.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.6831			(33)
Party Ceiling			78.0000			100.0000	7800.0000	(32b)
Internal Wall 1			90.0000			9.0000	810.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 16883.6000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	216.4564	(35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	10.0000	0.0500	0.5000	
E3 Sill	8.0000	0.0500	0.4000	
E4 Jamb	20.0000	0.0500	1.0000	
E20 Exposed floor (normal)	28.0000	0.3200	8.9600	
E7 Party floor between dwellings (in blocks of flats)	25.0000	0.0700	1.7500	
P7 Party Wall - Exposed floor (normal)	9.3000	0.1600	1.4880	
E16 Corner (normal)	9.0000	0.0900	0.8100	
E18 Party wall between dwellings	6.0000	0.0600	0.3600	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			15.2680	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	50.9511	(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	12.0813	11.9474	11.8135	11.1438	11.0099	10.3402	10.3402	10.2063	10.6081	11.0099	11.2777	11.5456	(38)
Heat transfer coeff	63.0324	62.8985	62.7645	62.0949	61.9610	61.2913	61.2913	61.1574	61.5592	61.9610	62.2288	62.4967	(39)
Average = Sum(39)m / 12 =												62.0614	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8081	0.8064	0.8047	0.7961	0.7944	0.7858	0.7858	0.7841	0.7892	0.7944	0.7978	0.8012	(40)
HLP (average)												0.7957	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4238 (42)

Hot water usage for mixer showers

71.1230	70.0342	68.4294	65.9608	63.7490	60.6547	58.2073	61.0684	62.5075	65.5723	68.7640	71.0589	(42a)

Hot water usage for baths

27.3903	26.9768	26.3886	25.5077	24.7138	23.6210	22.7919	23.8057	24.3378	25.4207	26.5465	27.3685	(42b)

Hot water usage for other uses

39.4523	38.0177	36.5831	35.1484	33.7138	32.2792	32.2792	33.7138	35.1484	36.5831	38.0177	39.4523	(42c)

Average daily hot water use (litres/day) 126.8329 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	137.9656	135.0286	131.4011	126.6169	122.1766	116.5548	113.2783	118.5879	121.9937	127.5760	133.3281	137.8798	(44)
Energy conte	203.1092	178.6702	187.7694	165.3934	157.4369	134.7918	125.1759	139.5802	141.5066	164.3945	180.1974	202.4865	(45)
Energy content (annual)										Total = Sum(45)m =		1980.5120	

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

30.4664	26.8005	28.1654	24.8090	23.6155	20.2188	18.7764	20.9370	21.2260	24.6592	27.0296	30.3730	(46)

Water storage loss:

Store volume 150.0000 (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

256.5036	226.8974	241.1638	217.0654	210.8313	186.4638	178.5703	192.9746	193.1786	217.7889	231.8694	255.8809	(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													
256.5036	226.8974	241.1638	217.0654	210.8313	186.4638	178.5703	192.9746	193.1786	217.7889	231.8694	255.8809	(64)
									Total per year (kWh/year) = Sum(64)m =		2609.1880	(64)
12Total per year (kWh/year)											2609	(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

110.2493	97.9896	105.1489	96.3309	95.0633	86.1559	84.3365	89.1259	88.3885	97.3767	101.2532	110.0423	(65)

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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	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.1312	128.5739	116.1312	120.0023	116.1312	120.0023	116.1312	116.1312	120.0023	116.1312	120.0023	116.1312	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.2098	217.4430	211.8154	199.8349	184.7117	170.4980	161.0024	158.7692	164.3968	176.3773	191.5005	205.7142	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	(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)	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	(71)
Water heating gains (Table 5)	148.1846	145.8178	141.3291	133.7929	127.7733	119.6609	113.3555	119.7929	122.7619	130.8827	140.6295	147.9063	(72)
Total internal gains	541.8829	554.1920	531.6330	515.9874	490.9734	469.5184	449.8464	454.0506	466.5182	485.7484	514.4895	532.1090	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.1400	10.6334	0.4000	0.7000	0.7700	6.4788	(74)
South	6.2000	46.7521	0.4000	0.7000	0.7700	56.2450	(78)
West	3.3000	19.6403	0.4000	0.7000	0.7700	12.5763	(80)

Solar gains	75.3000	129.0979	178.8925	225.5009	256.1355	255.8598	246.0192	222.9151	194.9903	143.2849	90.3430	64.3440	(83)
Total gains	617.1829	683.2899	710.5255	741.4882	747.1090	725.3782	695.8655	676.9656	661.5085	629.0334	604.8326	596.4530	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.4044	74.5628	74.7219	75.5278	75.6910	76.5180	76.5180	76.6855	76.1850	75.6910	75.3652	75.0422	
alpha	5.9603	5.9709	5.9815	6.0352	6.0461	6.1012	6.1012	6.1124	6.0790	6.0461	6.0243	6.0028	
util living area	0.9824	0.9668	0.9393	0.8635	0.7276	0.5349	0.3868	0.4144	0.6258	0.8682	0.9621	0.9852	(86)
MIT	20.2625	20.4180	20.5987	20.8159	20.9459	20.9929	20.9992	20.9987	20.9822	20.8371	20.5311	20.2349	(87)
Th 2	20.2463	20.2478	20.2493	20.2567	20.2582	20.2657	20.2657	20.2672	20.2627	20.2582	20.2552	20.2523	(88)
util rest of house	0.9782	0.9592	0.9256	0.8355	0.6813	0.4759	0.3226	0.3490	0.5650	0.8358	0.9521	0.9816	(89)
MIT 2	19.5830	19.7354	19.9098	20.1147	20.2230	20.2623	20.2654	20.2667	20.2534	20.1377	19.8532	19.5609	(90)
Living area fraction										fLA = Living area / (4) =		0.3590	(91)
MIT	19.8269	19.9805	20.1571	20.3664	20.4825	20.5246	20.5288	20.5295	20.5150	20.3888	20.0965	19.8029	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8269	19.9805	20.1571	20.3664	20.4825	20.5246	20.5288	20.5295	20.5150	20.3888	20.0965	19.8029	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9753	0.9561	0.9237	0.8399	0.6958	0.4969	0.3457	0.3725	0.5862	0.8420	0.9497	0.9790	(94)
Useful gains	601.9655	653.2847	656.3349	622.7594	519.8082	360.4432	240.5589	252.1676	387.8010	529.6304	574.3853	583.9392	(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	978.6968	948.5386	857.1810	712.0064	544.1704	363.1239	240.8019	252.5500	394.9009	606.5244	808.7595	975.1280	(97)
Space heating kWh	280.2881	198.4106	149.4295	64.2579	18.1255	0.0000	0.0000	0.0000	0.0000	57.2091	168.7494	291.0444	(98a)
Space heating requirement - total per year (kWh/year)												1227.5145	
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	280.2881	198.4106	149.4295	64.2579	18.1255	0.0000	0.0000	0.0000	0.0000	57.2091	168.7494	291.0444	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1227.5145	
Space heating per m2											(98c) / (4) =	15.7374	(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 %)												219.3000	(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	280.2881	198.4106	149.4295	64.2579	18.1255	0.0000	0.0000	0.0000	0.0000	57.2091	168.7494	291.0444	(98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)	127.8103	90.4745	68.1393	29.3014	8.2652	0.0000	0.0000	0.0000	0.0000	26.0872	76.9491	132.7152	(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	256.5036	226.8974	241.1638	217.0654	210.8313	186.4638	178.5703	192.9746	193.1786	217.7889	231.8694	255.8809	(64)
Efficiency of water heater												190.4000	(216)
(217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(217)
Fuel for water heating, kWh/month	134.7183	119.1688	126.6617	114.0049	110.7307	97.9326	93.7869	101.3522	101.4594	114.3850	121.7802	134.3912	(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	20.3668	18.3959	20.3668	19.7099	20.3668	19.7099	20.3668	20.3668	19.7099	20.3668	19.7099	20.3668	(231)
Lighting	22.4529	18.0125	16.2183	11.8822	9.1782	7.4986	8.3726	10.8831	14.1360	18.5472	20.9491	23.0769	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-9.7006	-16.9920	-30.7395	-41.9677	-51.1332	-49.7600	-48.6367	-42.5445	-32.5197	-21.6390	-11.5455	-7.9433	(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	-1.4416	-3.9099	-10.4007	-20.2403	-31.1472	-33.1840	-32.3581	-24.7369	-15.1731	-6.6449	-2.1403	-1.0561	(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	559.7422	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	190.4000	
Water heating fuel used	1370.3719	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)

mechanical ventilation fans (SFP = 0.8400) 239.8032 (230a)

Total electricity for the above, kWh/year	239.8032	(231)
Electricity for lighting (calculated in Appendix L)	181.2077	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-547.5548	(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	1803.5701	(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	559.7422	0.1569	87.8152	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1370.3719	0.1409	193.0672	(264)
Space and water heating			280.8823	(265)
Pumps, fans and electric keep-hot	239.8032	0.1387	33.2637	(267)
Energy for lighting	181.2077	0.1443	26.1539	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-365.1216	0.1310	-47.8373	
PV Unit electricity exported	-182.4332	0.1201	-21.9111	
Total			-69.7484	(269)
Total CO2, kg/year			270.5515	(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	559.7422	1.5808	884.8389	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1370.3719	1.5209	2084.2619	(278)
Space and water heating			2969.1008	(279)
Pumps, fans and electric keep-hot	239.8032	1.5128	362.7743	(281)
Energy for lighting	181.2077	1.5338	277.9425	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-365.1216	1.4840	-541.8460	
PV Unit electricity exported	-182.4332	0.4406	-80.3730	
Total			-622.2190	(283)
Total Primary energy kWh/year			2987.5985	(286)
Dwelling Primary energy Rate (DPER)			38.3000	(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	78.0000 (1b)	x	3.0000 (2b)	=	234.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 78.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	234.0000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (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) =	30.0000 / (5) =	0.1282 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3782 (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) =	0.3498 (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													

	0.4460	0.4373	0.4286	0.3848	0.3761	0.3323	0.3323	0.3236	0.3498	0.3761	0.3936	0.4111	(22b)
Effective ac	0.5995	0.5956	0.5918	0.5740	0.5707	0.5552	0.5552	0.5524	0.5612	0.5707	0.5774	0.5845	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			12.6400	1.1450	14.4733			(27)
Heatloss Floor 1			78.0000	0.1300	10.1400			(28b)
South	29.0000	6.2000	22.8000	0.1800	4.1040			(29a)
North	29.0000	3.1400	25.8600	0.1800	4.6548			(29a)
West	28.0000	5.5000	22.5000	0.1800	4.0500			(29a)
Wall to Common	28.0000		28.0000	0.1800	5.0400			(29a)
External Roof 1	6.0000		6.0000	0.1100	0.6600			(30)
Total net area of external elements Aum(A, m2)			198.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.3221			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 196.4564 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.0000	0.0500	0.5000
E3 Sill	8.0000	0.0500	0.4000
E4 Jamb	20.0000	0.0500	1.0000
E20 Exposed floor (normal)	28.0000	0.3200	8.9600
E7 Party floor between dwellings (in blocks of flats)	25.0000	0.0700	1.7500
P7 Party Wall - Exposed floor (normal)	9.3000	0.1600	1.4880
E16 Corner (normal)	9.0000	0.0900	0.8100
E18 Party wall between dwellings	6.0000	0.0600	0.3600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.2680 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 60.5901 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	46.2917	45.9934	45.7010	44.3277	44.0708	42.8747	42.8747	42.6532	43.3354	44.0708	44.5906	45.1340	(38)
Heat transfer coeff	106.8818	106.5835	106.2911	104.9178	104.6609	103.4648	103.4648	103.2432	103.9255	104.6609	105.1807	105.7241	(39)
Average = Sum(39)m / 12 =												104.9166	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3703	1.3665	1.3627	1.3451	1.3418	1.3265	1.3265	1.3236	1.3324	1.3418	1.3485	1.3554	(40)
HLP (average)												1.3451	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4238	(42)
Hot water usage for mixer showers	64.8591	63.8844	62.4641	59.7465	57.7410	55.5045	54.2333	55.6429	57.1881	59.5894	62.3653	64.6106	(42a)
Hot water usage for baths	28.0148	27.5987	27.0128	25.9325	25.1236	24.2267	23.7422	24.3240	24.9575	25.9172	27.0198	27.9201	(42b)
Hot water usage for other uses	39.4523	38.0177	36.5831	35.1484	33.7138	32.2792	32.2792	33.7138	35.1484	36.5831	38.0177	39.4523	(42c)
Average daily hot water use (litres/day)												121.6378	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.3262	129.5008	126.0600	120.8275	116.5785	112.0104	110.2546	113.6807	117.2939	122.0897	127.4028	131.9830	(44)
Energy conte	209.5724	184.4075	193.7495	165.4068	156.9370	137.7298	133.3434	140.7604	144.6352	165.6745	181.5086	206.6535	(45)
Energy content (annual)										Total = Sum(45)m =		2020.3786	
Distribution loss (46)m = 0.15 x (45)m	31.4359	27.6611	29.0624	24.8110	23.5406	20.6595	20.0015	21.1141	21.6953	24.8512	27.2263	30.9980	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	256.1673	226.4932	240.3444	210.4986	203.5319	182.8217	179.9383	187.3553	189.7270	212.2694	226.6004	253.2484	(62)
WWHRS	-29.6509	-26.2235	-27.4597	-22.7377	-21.1908	-18.1331	-16.9969	-18.0745	-18.7612	-22.1174	-25.0563	-29.1018	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	226.5164	200.2697	212.8846	187.7609	182.3412	164.6886	162.9415	169.2808	170.9658	190.1521	201.5441	224.1466	(64)
										Total per year (kWh/year) = Sum(64)m =		2293.4923	(64)
12Total per year (kWh/year)												2293	(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	106.9587	94.9841	101.6976	91.0712	89.4575	81.8686	81.6126	84.0788	84.1647	92.3627	96.4251	105.9882	(65)

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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	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	121.1909	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.9645	125.0678	112.9645	116.7300	112.9645	116.7300	112.9645	112.9645	116.7300	112.9645	116.7300	112.9645	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.2098	217.4430	211.8154	199.8349	184.7117	170.4980	161.0024	158.7692	164.3968	176.3773	191.5005	205.7142	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	35.1191	(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)													
	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	-96.9527	(71)
Water heating gains (Table 5)													
	143.7618	141.3453	136.6904	126.4878	120.2385	113.7064	109.6944	113.0091	116.8954	124.1434	133.9237	142.4573	(72)
Total internal gains													
	534.2933	546.2134	523.8275	505.4100	480.2720	460.2917	443.0185	444.1000	457.3794	475.8424	504.5115	523.4932	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.1400	10.6334	0.6300	0.7000	0.7700	10.2041	(74)
South	6.2000	46.7521	0.6300	0.7000	0.7700	88.5858	(78)
West	3.3000	19.6403	0.6300	0.7000	0.7700	19.8077	(80)

Solar gains	118.5976	203.3293	281.7557	355.1639	403.4134	402.9792	387.4802	351.0912	307.1097	225.6738	142.2903	101.3418	(83)
Total gains	652.8909	749.5427	805.5832	860.5739	883.6854	863.2708	830.4987	795.1912	764.4891	701.5162	646.8017	624.8350	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.8249	39.9363	40.0462	40.5704	40.6700	41.1402	41.1402	41.2284	40.9578	40.6700	40.4690	40.2610	
alpha	3.6550	3.6624	3.6697	3.7047	3.7113	3.7427	3.7427	3.7486	3.7305	3.7113	3.6979	3.6841	
util living area													
	0.9838	0.9723	0.9536	0.9091	0.8240	0.6745	0.5205	0.5591	0.7627	0.9203	0.9721	0.9861	(86)
MIT	19.1967	19.4407	19.7781	20.2271	20.6108	20.8728	20.9634	20.9517	20.7868	20.2969	19.6789	19.1635	(87)
Th 2	19.7862	19.7891	19.7920	19.8057	19.8082	19.8202	19.8202	19.8224	19.8156	19.8082	19.8031	19.7977	(88)
util rest of house													
	0.9795	0.9651	0.9410	0.8831	0.7715	0.5802	0.3932	0.4323	0.6800	0.8921	0.9635	0.9824	(89)
MIT 2	17.7293	18.0389	18.4640	19.0235	19.4683	19.7401	19.8066	19.8028	19.6642	19.1198	18.3527	17.6947	(90)
Living area fraction										fLA = Living area / (4) =		0.3590	(91)
MIT	18.2561	18.5421	18.9357	19.4555	19.8784	20.1467	20.2219	20.2152	20.0672	19.5424	18.8288	18.2220	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2561	18.5421	18.9357	19.4555	19.8784	20.1467	20.2219	20.2152	20.0672	19.5424	18.8288	18.2220	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9720	0.9552	0.9296	0.8740	0.7750	0.6083	0.4383	0.4767	0.6995	0.8843	0.9541	0.9756	(94)
Useful gains	634.5812	715.9401	748.8470	752.1040	684.8692	525.1171	364.0270	379.0860	534.7782	620.3849	617.1145	609.5801	(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													
	1491.6500	1454.0282	1321.8061	1107.4649	855.9629	573.8847	374.7344	393.8923	620.1407	935.9147	1233.6395	1482.4610	(97)
Space heating kWh													
	637.6592	495.9952	426.2815	255.8599	127.2937	0.0000	0.0000	0.0000	0.0000	234.7542	443.8980	649.4234	(98a)
Space heating requirement - total per year (kWh/year)												3271.1651	
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													
	637.6592	495.9952	426.2815	255.8599	127.2937	0.0000	0.0000	0.0000	0.0000	234.7542	443.8980	649.4234	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3271.1651	
Space heating per m2											(98c) / (4) =	41.9380	(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													
	637.6592	495.9952	426.2815	255.8599	127.2937	0.0000	0.0000	0.0000	0.0000	234.7542	443.8980	649.4234	(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)													
	690.8551	537.3729	461.8435	277.2046	137.9130	0.0000	0.0000	0.0000	0.0000	254.3382	480.9296	703.6006	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	226.5164	200.2697	212.8846	187.7609	182.3412	164.6886	162.9415	169.2808	170.9658	190.1521	201.5441	224.1466	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.2502	86.0098	85.5851	84.7543	83.2695	79.8000	79.8000	79.8000	79.8000	84.5335	85.7791	86.3025	(217)
Fuel for water heating, kWh/month													
	262.6270	232.8451	248.7403	221.5356	218.9770	206.3767	204.1873	212.1314	214.2429	224.9430	234.9571	259.7219	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	23.4718	18.8299	16.9543	12.4214	9.5947	7.8389	8.7526	11.3769	14.7775	19.3889	21.8997	24.1241	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.4082	-38.3633	-56.7994	-65.8408	-72.7003	-68.4715	-67.6299	-63.0084	-55.1352	-44.7495	-29.4322	-22.7009	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)

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

(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)

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

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

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

(233b)m	-11.6609	-24.8439	-49.9667	-75.9120	-101.2227	-102.0192	-100.8212	-84.9779	-61.7760	-35.8160	-15.6611	-9.1980	(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	3544.0575	(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	2741.2851	(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)	189.4308	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1285.1151	(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	5275.6583	(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	3544.0575	0.2100	744.2521	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2741.2851	0.2100	575.6699	(264)
Space and water heating			1319.9220	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	189.4308	0.1443	27.3407	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-611.2397	0.1340	-81.8820	
PV Unit electricity exported	-673.8755	0.1256	-84.6115	
Total			-166.4936	(269)
Total CO2, kg/year			1192.6984	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.2900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3544.0575	1.1300	4004.7850	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2741.2851	1.1300	3097.6522	(278)
Space and water heating			7102.4372	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	189.4308	1.5338	290.5553	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-611.2397	1.4951	-913.8402	
PV Unit electricity exported	-673.8755	0.4609	-310.5717	
Total			-1224.4120	(283)
Total Primary energy kWh/year			6298.6814	(286)
Target Primary Energy Rate (TPER)			80.7500	(287)

Summary for Input Data

elmhurst energy

Property Reference	3-G-N ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	3-G-N ASHP + PV	**Prop Type Ref**	3-G-N Gas
Property			

SAP Rating	85 B	**DER**	4.26	**TER**	19.55
Environmental	97 A	**% DER < TER**			78.21
CO_2 Emissions (t/year)	0.2	**DFEE**	52.60	**TFEE**	60.66
Compliance Check	See BREL	**% DFEE < TFEE**			13.29
% DPER < TPER	54.21	**DPER**	47.55	**TPER**	103.84

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	22.00 m	54.30 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	23.20	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	20.00	16.00	0.00	None	4.00	Enter Gross Area
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	18.00	14.86	0.00	None	3.14	Enter Gross Area
West	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	28.00	22.60	0.00	None	5.40	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	6.00	6.00	2.50	Stairwell Stairwell 2	0.00	Enter Gross Area
Wall to Stores	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	42.00	42.00	0.70	Garage Single 1 Inside	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)

Internal Wall 1		Plasterboard on timber frame							9.00	54.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	6.00	6.00	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling	Concrete floor slab, carpeted	100.00	48.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Exposed Floor - Solid	Lowest occupied	Other	0.11	None	0.00	0.00	55.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
North	Window	North	North	4.00	0
West	Window	West	East	3.20	0
South	Window	South	South	3.14	0
Door	Door	West	West	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	8.50	0.05	0.05	No
E3 Sill	Independently assessed	6.50	0.05	0.05	No
E4 Jamb	Independently assessed	22.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	22.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	22.00	0.07	0.07	No
P7 Party Wall - Exposed floor (normal)	Independently assessed	14.50	0.16	0.16	No
E16 Corner (normal)	Independently assessed	9.00	0.09	0.09	No
E18 Party wall between dwellings	Independently assessed	12.00	0.06	0.06	No

Y-value	0.08	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)

Summary for Input Data

elmhurst energy

Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	SAP table	
Description	Default ASHP	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Electricity	
SAP Code	224	
In Winter	219.30	
In Summer	190.40	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2210	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No

Summary for Input Data

Cold Water Source	From header tank
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store	None

32.0 Photovoltaic Unit	One Dwelling	
Export Capable Meter?	Yes	
Connected To Dwelling	Yes	
Diverter	No	
Battery Capacity [kWh]	0.00	

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.90	South	Horizontal	Modest	No	No	0.80		

34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	3-G-N ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	3-G-N ASHP + PV	**Prop Type Ref**	3-G-N Gas
Property			

SAP Rating	85 B	**DER**	4.26	**TER**	19.55
Environmental	97 A	**% DER < TER**			78.21
CO_2 Emissions (t/year)	0.2	**DFEE**	52.60	**TFEE**	60.66
Compliance Check	See BREL	**% DFEE < TFEE**			13.29
% DPER < TPER	54.21	**DPER**	47.55	**TPER**	103.84

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.3000	(1b)	x 3.0000	(2b) =	162.9000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		162.9000	(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	0 * 10 =	0.0000 (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) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		1.5000 (17)
Infiltration rate		0.0750 (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) =	0.0694 (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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	86.4000 (23c)

Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(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	
Window (Uw = 0.90)			10.3400	0.8687	8.9826			(27)
Door			2.2000	1.1000	2.4200			(26)
Heatloss Floor 1			55.0000	0.1100	6.0500			(28b)
North	20.0000	4.0000	16.0000	0.1400	2.2400	110.0000	1760.0000	(29a)
South	18.0000	3.1400	14.8600	0.1400	2.0804	110.0000	1634.6000	(29a)
West	28.0000	5.4000	22.6000	0.1400	3.1640	110.0000	2486.0000	(29a)
Wall to Common	6.0000		6.0000	0.1100	0.6600	14.0000	84.0000	(29a)
Wall to Stores	42.0000		42.0000	0.1300	5.4600	110.0000	4620.0000	(29a)
External Roof 1	6.0000		6.0000	0.1100	0.6600	9.0000	54.0000	(30)
Total net area of external elements Aum(A, m2)			175.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.7170			(33)
Party Ceiling			48.0000			100.0000	4800.0000	(32b)
Internal Wall 1			54.0000			9.0000	486.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15924.6000 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 293.2707 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3	Sill	6.5000	0.0500	0.3250
E4	Jamb	22.0000	0.0500	1.1000
E20	Exposed floor (normal)	22.0000	0.3200	7.0400
E7	Party floor between dwellings (in blocks of flats)	22.0000	0.0700	1.5400
P7	Party Wall - Exposed floor (normal)	14.5000	0.1600	2.3200
E16	Corner (normal)	9.0000	0.0900	0.8100
E18	Party wall between dwellings	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.2800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 45.9970 (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	8.4105	8.3172	8.2240	7.7578	7.6646	7.1984	7.1984	7.1052	7.3849	7.6646	7.8510	8.0375	(38)
Heat transfer coeff	54.4075	54.3142	54.2210	53.7548	53.6616	53.1954	53.1954	53.1022	53.3819	53.6616	53.8481	54.0345	(39)

Average = Sum(39)m / 12 = 53.7315

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0020	1.0003	0.9985	0.9900	0.9882	0.9797	0.9797	0.9779	0.9831	0.9882	0.9917	0.9951	(40)
HLP (average)												0.9895	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

---
4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8168 (42)
Hot water usage for mixer showers

59.9626	59.0446	57.6917	55.6104	53.7457	51.1369	49.0736	51.4858	52.6990	55.2829	57.9737	59.9086	(42a)

Hot water usage for baths

23.1112	22.7623	22.2660	21.5227	20.8529	19.9307	19.2312	20.0866	20.5356	21.4493	22.3992	23.0928	(42b)

Hot water usage for other uses

33.2361	32.0275	30.8189	29.6103	28.4017	27.1931	27.1931	28.4017	29.6103	30.8189	32.0275	33.2361	(42c)

Average daily hot water use (litres/day) 106.9250 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	116.3099	113.8344	110.7766	106.7435	103.0003	98.2608	95.4979	99.9741	102.8449	107.5510	112.4004	116.2375	(44)
Energy conte	171.2282	150.6259	158.2974	139.4336	132.7263	113.6354	105.5280	117.6714	119.2949	138.5904	151.9129	170.7032	(45)
Energy content (annual)										Total = Sum(45)m =		1669.6475	
Distribution loss (46)m = 0.15 x (45)m	25.6842	22.5939	23.7446	20.9150	19.9089	17.0453	15.8292	17.6507	17.8942	20.7886	22.7869	25.6055	(46)

Water storage loss:
Store volume 150.0000 (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

224.6226	198.8531	211.6918	191.1056	186.1207	165.3074	158.9224	171.0658	170.9669	191.9848	203.5849	224.0976	(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	224.6226	198.8531	211.6918	191.1056	186.1207	165.3074	158.9224	171.0658	170.9669	191.9848	203.5849	224.0976	(64)
									Total per year (kWh/year) = Sum(64)m =			2298.3235	(64)
12Total per year (kWh/year)												2298	(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

99.6489	88.6649	95.3494	87.6993	86.8470	79.1214	77.8036	81.8412	81.0032	88.7968	91.8486	99.4743	(65)

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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	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	82.6947	91.5549	82.6947	85.4512	82.6947	85.4512	82.6947	82.6947	85.4512	82.6947	85.4512	82.6947	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	158.3798	160.0233	155.8818	147.0649	135.9353	125.4749	118.4868	116.8433	120.9848	129.8017	140.9314	151.3917	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	(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)	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	(71)
Water heating gains (Table 5)	133.9367	131.9418	128.1578	121.8046	116.7299	109.8908	104.5747	110.0017	112.5044	119.3506	127.5676	133.7021	(72)
Total internal gains	428.2635	436.7723	419.9866	407.5730	388.6121	371.0692	356.0085	359.7920	369.1928	385.0993	407.2024	421.0408	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.0000	10.6334	0.4000	0.7000	0.7700	8.2532	(74)
East	3.2000	19.6403	0.4000	0.7000	0.7700	12.1952	(76)
South	3.1400	46.7521	0.4000	0.7000	0.7700	28.4854	(78)

Solar gains	48.9338	86.2804	125.5150	167.5128	198.2031	201.3218	192.2087	168.6823	139.9946	97.4007	59.1522	41.5230	(83)
Total gains	477.1973	523.0526	545.5017	575.0858	586.8152	572.3910	548.2172	528.4743	509.1873	482.5000	466.3547	462.5638	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.3032	81.4427	81.5828	82.2903	82.4333	83.1556	83.1556	83.3017	82.8652	82.4333	82.1478	81.8643	
alpha	6.4202	6.4295	6.4389	6.4860	6.4956	6.5437	6.5437	6.5534	6.5243	6.4956	6.4765	6.4576	
util living area	0.9923	0.9849	0.9688	0.9134	0.7873	0.5866	0.4260	0.4606	0.6969	0.9207	0.9819	0.9937	(86)
MIT	20.2261	20.3607	20.5414	20.7770	20.9339	20.9916	20.9991	20.9985	20.9759	20.7971	20.4822	20.2020	(87)
Th 2	20.0817	20.0831	20.0845	20.0917	20.0931	20.1003	20.1003	20.1018	20.0974	20.0931	20.0903	20.0874	(88)
util rest of house	0.9896	0.9797	0.9580	0.8851	0.7304	0.5081	0.3395	0.3716	0.6171	0.8889	0.9746	0.9914	(89)
MIT 2	19.3944	19.5276	19.7037	19.9267	20.0543	20.0971	20.1001	20.1014	20.0869	19.9496	19.6538	19.3753	(90)
Living area fraction										fLA = Living area / (4) =		0.4273	(91)
MIT	19.7498	19.8836	20.0616	20.2900	20.4301	20.4793	20.4842	20.4847	20.4667	20.3117	20.0078	19.7285	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7498	19.8836	20.0616	20.2900	20.4301	20.4793	20.4842	20.4847	20.4667	20.3117	20.0078	19.7285	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9884	0.9784	0.9577	0.8920	0.7526	0.5416	0.3765	0.4097	0.6508	0.8975	0.9739	0.9903	(94)
Useful gains	471.6711	511.7342	522.4064	512.9498	441.6378	310.0058	206.4052	216.5328	331.3767	433.0566	454.1616	458.0746	(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	840.5827	813.8211	735.3237	612.2669	468.4734	312.7522	206.6225	216.9067	339.8669	521.1449	695.0579	839.0758	(97)
Space heating kWh	274.4702	203.0024	158.4104	71.5083	19.9657	0.0000	0.0000	0.0000	0.0000	65.5377	173.4454	283.4649	(98a)
Space heating requirement - total per year (kWh/year)												1249.8050	
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	274.4702	203.0024	158.4104	71.5083	19.9657	0.0000	0.0000	0.0000	0.0000	65.5377	173.4454	283.4649	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1249.8050	
Space heating per m2											(98c) / (4) =	23.0167	(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 %) 219.3000 (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	274.4702	203.0024	158.4104	71.5083	19.9657	0.0000	0.0000	0.0000	0.0000	65.5377	173.4454	283.4649	(98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)	125.1574	92.5684	72.2346	32.6075	9.1043	0.0000	0.0000	0.0000	0.0000	29.8850	79.0904	129.2590	(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	224.6226	198.8531	211.6918	191.1056	186.1207	165.3074	158.9224	171.0658	170.9669	191.9848	203.5849	224.0976	(64)
Efficiency of water heater												190.4000	(216)
(217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(217)
Fuel for water heating, kWh/month	117.9741	104.4396	111.1827	100.3706	97.7525	86.8211	83.4676	89.8455	89.7936	100.8323	106.9248	117.6983	(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	14.1785	12.8064	14.1785	13.7211	14.1785	13.7211	14.1785	14.1785	13.7211	14.1785	13.7211	14.1785	(231)
Lighting	15.9883	12.8264	11.5487	8.4611	6.5356	5.3396	5.9620	7.7496	10.0660	13.2071	14.9174	16.4326	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-9.5655	-16.6405	-29.8146	-40.1149	-48.1735	-46.5705	-45.5296	-40.1084	-30.9455	-20.9918	-11.3456	-7.8447	(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	-1.5767	-4.2613	-11.3256	-22.0931	-34.1069	-36.3735	-35.4653	-27.1730	-16.7473	-7.2921	-2.3402	-1.1548	(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												569.9065	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												190.4000	
Water heating fuel used												1207.1027	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)

mechanical ventilation fans (SFP = 0.8400)	166.9399	(230a)
Total electricity for the above, kWh/year	166.9399	(231)
Electricity for lighting (calculated in Appendix L)	129.0344	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-547.5548	(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	1525.4287	(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	569.9065	0.1565	89.2043	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1207.1027	0.1408	169.9520	(264)
Space and water heating			259.1564	(265)
Pumps, fans and electric keep-hot	166.9399	0.1387	23.1566	(267)
Energy for lighting	129.0344	0.1443	18.6236	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-347.6450	0.1313	-45.6351	
PV Unit electricity exported	-199.9098	0.1200	-23.9977	
Total			-69.6328	(269)
Total CO2, kg/year			231.3038	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.2600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	569.9065	1.5795	900.1562	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1207.1027	1.5206	1835.5161	(278)
Space and water heating			2735.6723	(279)
Pumps, fans and electric keep-hot	166.9399	1.5128	252.5467	(281)
Energy for lighting	129.0344	1.5338	197.9172	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-347.6450	1.4850	-516.2403	
PV Unit electricity exported	-199.9098	0.4403	-88.0259	
Total			-604.2662	(283)
Total Primary energy kWh/year			2581.8701	(286)
Dwelling Primary energy Rate (DPER)			47.5500	(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	54.3000	(1b)	x 3.0000	(2b) =	162.9000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 54.3000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		162.9000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1228	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3728	(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) = 0.3448	(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													
	0.4396	0.4310	0.4224	0.3793	0.3707	0.3276	0.3276	0.3190	0.3448	0.3707	0.3879	0.4052	(22b)
Effective ac	0.5966	0.5929	0.5892	0.5719	0.5687	0.5537	0.5537	0.5509	0.5594	0.5687	0.5752	0.5821	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			10.3400	1.1450	11.8397			(27)
Heatloss Floor 1			55.0000	0.1300	7.1500			(28b)
North	20.0000	4.0000	16.0000	0.1800	2.8800			(29a)
South	18.0000	3.1400	14.8600	0.1800	2.6748			(29a)
West	28.0000	5.4000	22.6000	0.1800	4.0680			(29a)
Wall to Common	6.0000		6.0000	0.1800	1.0800			(29a)
Wall to Stores	42.0000		42.0000	0.1800	7.5600			(29a)
External Roof 1	6.0000		6.0000	0.1100	0.6600			(30)
Total net area of external elements Aum(A, m2)			175.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1125			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	275.5912	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3 Sill	6.5000	0.0500	0.3250
E4 Jamb	22.0000	0.0500	1.1000
E20 Exposed floor (normal)	22.0000	0.3200	7.0400
E7 Party floor between dwellings (in blocks of flats)	22.0000	0.0700	1.5400
P7 Party Wall - Exposed floor (normal)	14.5000	0.1600	2.3200
E16 Corner (normal)	9.0000	0.0900	0.8100
E18 Party wall between dwellings	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.2800	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	54.3925	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.0737	31.8720	31.6742	30.7454	30.5717	29.7627	29.7627	29.6129	30.0743	30.5717	30.9232	31.2907	(38)
Heat transfer coeff	86.4662	86.2645	86.0667	85.1379	84.9642	84.1552	84.1552	84.0054	84.4668	84.9642	85.3157	85.6832	(39)
Average = Sum(39)m / 12 =												85.1371	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5924	1.5887	1.5850	1.5679	1.5647	1.5498	1.5498	1.5471	1.5556	1.5647	1.5712	1.5780	(40)
HLP (average)												1.5679	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8168	(42)
Hot water usage for mixer showers													
	54.6816	53.8599	52.6624	50.3713	48.6805	46.7949	45.7232	46.9116	48.2143	50.2388	52.5791	54.4721	(42a)
Hot water usage for baths													
	23.6381	23.2871	22.7927	21.8812	21.1986	20.4418	20.0330	20.5239	21.0584	21.8683	22.7986	23.5582	(42b)
Hot water usage for other uses													
	33.2361	32.0275	30.8189	29.6103	28.4017	27.1931	27.1931	28.4017	29.6103	30.8189	32.0275	33.2361	(42c)
Average daily hot water use (litres/day)												102.5455	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.5558	109.1744	106.2740	101.8628	98.2808	94.4299	92.9493	95.8372	98.8830	102.9260	107.4052	111.2664	(44)
Energy conte	176.6771	155.4629	163.3392	139.4450	132.3049	116.1126	112.4142	118.6665	121.9327	139.6695	153.0184	174.2163	(45)
Energy content (annual)										Total = Sum(45)m =		1703.2592	
Distribution loss (46)m = 0.15 x (45)m													
	26.5016	23.3194	24.5009	20.9168	19.8457	17.4169	16.8621	17.8000	18.2899	20.9504	22.9528	26.1324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	223.2720	197.5486	209.9341	184.5369	178.8998	161.2044	159.0091	165.2614	167.0245	186.2644	198.1102	220.8112	(62)
WWHRS	-24.9982	-22.1086	-23.1508	-19.1698	-17.8656	-15.2877	-14.3298	-15.2383	-15.8172	-18.6468	-21.1245	-24.5352	(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													
	198.2739	175.4401	186.7833	165.3671	161.0343	145.9167	144.6793	150.0231	151.2073	167.6177	176.9857	196.2760	(64)
										Total per year (kWh/year) = Sum(64)m =		2019.6042	(64)
12Total per year (kWh/year)												2020	(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													
	96.0211	85.3600	91.5862	82.4389	81.2673	74.6809	74.6536	76.7325	76.6161	83.7160	86.9521	95.2028	(65)

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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	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	80.9187	89.5886	80.9187	83.6160	80.9187	83.6160	80.9187	80.9187	83.6160	80.9187	83.6160	80.9187	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	158.3798	160.0233	155.8818	147.0649	135.9353	125.4749	118.4868	116.8433	120.9848	129.8017	140.9314	151.3917	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	(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)													
	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	(71)
Water heating gains (Table 5)													
	129.0606	127.0238	123.0997	114.4985	109.2303	103.7235	100.3409	103.1351	106.4112	112.5216	120.7668	127.9608	(72)
Total internal gains													
	421.6114	429.8880	413.1525	398.4318	379.3365	363.0667	349.9987	351.1495	361.2644	376.4943	398.5664	413.5235	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.0000	10.6334	0.6300	0.7000	0.7700	12.9988	(74)
East	3.2000	19.6403	0.6300	0.7000	0.7700	19.2074	(76)
South	3.1400	46.7521	0.6300	0.7000	0.7700	44.8644	(78)

Solar gains	77.0707	135.8916	197.6862	263.8327	312.1698	317.0818	302.7287	265.6745	220.4915	153.4061	93.1648	65.3987	(83)
Total gains	498.6821	565.7796	610.8387	662.2645	691.5064	680.1485	652.7274	616.8240	581.7558	529.9004	491.7312	478.9222	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.0747	48.1871	48.2978	48.8247	48.9246	49.3948	49.3948	49.4829	49.2126	48.9246	48.7230	48.5140	
alpha	4.2050	4.2125	4.2199	4.2550	4.2616	4.2930	4.2930	4.2989	4.2808	4.2616	4.2482	4.2343	
util living area													
	0.9925	0.9864	0.9743	0.9396	0.8597	0.7065	0.5446	0.5923	0.8114	0.9514	0.9860	0.9937	(86)
MIT	19.3869	19.5871	19.8892	20.3040	20.6660	20.9007	20.9747	20.9639	20.8106	20.3522	19.8045	19.3585	(87)
Th 2	19.6189	19.6217	19.6243	19.6369	19.6393	19.6503	19.6503	19.6524	19.6461	19.6393	19.6345	19.6295	(88)
util rest of house													
	0.9897	0.9813	0.9642	0.9143	0.7998	0.5909	0.3889	0.4354	0.7142	0.9257	0.9797	0.9913	(89)
MIT 2	17.8065	18.0619	18.4440	18.9613	19.3731	19.5996	19.6441	19.6422	19.5299	19.0315	18.3487	17.7774	(90)
Living area fraction											fLA = Living area / (4) =	0.4273	(91)
MIT	18.4817	18.7136	19.0615	19.5350	19.9255	20.1555	20.2126	20.2069	20.0771	19.5958	18.9707	18.4529	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4817	18.7136	19.0615	19.5350	19.9255	20.1555	20.2126	20.2069	20.0771	19.5958	18.9707	18.4529	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9864	0.9767	0.9588	0.9120	0.8142	0.6375	0.4562	0.5032	0.7492	0.9246	0.9756	0.9884	(94)
Useful gains	491.8893	552.6177	585.6769	603.9964	563.0332	433.6283	297.7987	310.3641	435.8461	489.9723	479.7084	473.3513	(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													
	1226.2391	1191.6196	1081.1233	905.4409	698.8748	467.5252	304.0182	319.7978	504.8642	764.3177	1012.7531	1221.2373	(97)
Space heating kWh													
	546.3563	429.4093	368.6121	217.0400	101.0662	0.0000	0.0000	0.0000	0.0000	204.1130	383.7922	556.4272	(98a)
Space heating requirement - total per year (kWh/year)												2806.8162	
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													
	546.3563	429.4093	368.6121	217.0400	101.0662	0.0000	0.0000	0.0000	0.0000	204.1130	383.7922	556.4272	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2806.8162	
Space heating per m2											(98c) / (4) =	51.6909	(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													
	546.3563	429.4093	368.6121	217.0400	101.0662	0.0000	0.0000	0.0000	0.0000	204.1130	383.7922	556.4272	(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)													
	591.9353	465.2322	399.3630	235.1463	109.4975	0.0000	0.0000	0.0000	0.0000	221.1408	415.8095	602.8463	(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													
	198.2739	175.4401	186.7833	165.3671	161.0343	145.9167	144.6793	150.0231	151.2073	167.6177	176.9857	196.2760	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.2110	85.9871	85.5550	84.6705	83.0455	79.8000	79.8000	79.8000	79.8000	84.5026	85.7478	86.2631	(217)
Fuel for water heating, kWh/month													
	229.9867	204.0307	218.3196	195.3065	193.9108	182.8530	181.3024	187.9989	189.4828	198.3579	206.4025	227.5318	(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	16.8133	13.4883	12.1447	8.8977	6.8729	5.6152	6.2696	8.1495	10.5854	13.8886	15.6872	17.2806	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.6464	-27.2298	-40.5371	-47.2765	-52.4789	-49.5590	-48.9787	-45.5094	-39.6208	-31.9129	-20.8408	-16.0147	(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	-7.8556	-16.7721	-33.7885	-51.4052	-68.5982	-69.1287	-68.2892	-57.5119	-41.7674	-24.1731	-10.5510	-6.1918 (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	3040.9709	(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	2415.4837	(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)	135.6930	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-894.6378	(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	4783.5098	(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	3040.9709	0.2100	638.6039	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2415.4837	0.2100	507.2516	(264)
Space and water heating			1145.8555	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.6930	0.1443	19.5847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-438.6052	0.1338	-58.6981	
PV Unit electricity exported	-456.0326	0.1255	-57.2456	
Total			-115.9437	(269)
Total CO2, kg/year			1061.4257	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			19.5500	(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	3040.9709	1.1300	3436.2972	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2415.4837	1.1300	2729.4966	(278)
Space and water heating			6165.7937	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.6930	1.5338	208.1305	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-438.6052	1.4946	-655.5246	
PV Unit electricity exported	-456.0326	0.4608	-210.1232	
Total			-865.6479	(283)
Total Primary energy kWh/year			5638.3772	(286)
Target Primary Energy Rate (TPER)			103.8400	(287)

Summary for Input Data

elmhurst energy

Property Reference	3-G-S ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	3-G-S ASHP + PV	**Prop Type Ref**	3-G-S Gas
Property			

SAP Rating	85 B	**DER**	4.22	**TER**	19.35
Environmental	97 A	**% DER < TER**			78.19
CO_2 Emissions (t/year)	0.2	**DFEE**	51.98	**TFEE**	59.75
Compliance Check	See BREL	**% DFEE < TFEE**			13.01
% DPER < TPER	54.11	**DPER**	47.17	**TPER**	102.78

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	22.00 m	54.30 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	23.20	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	20.00	16.00	0.00	None	4.00	Enter Gross Area
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	18.00	14.86	0.00	None	3.14	Enter Gross Area
East	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	28.00	22.60	0.00	None	5.40	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	6.00	6.00	2.50	Stairwell Stairwell 2	0.00	Enter Gross Area
Wall to Stores	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	42.00	42.00	0.70	Garage Single 1 Inside	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)

Internal Wall 1		Plasterboard on timber frame	9.00	54.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	6.00	6.00	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling	Concrete floor slab, carpeted	100.00	48.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Exposed Floor - Solid	Lowest occupied	Other	0.11	None	0.00	0.00	55.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
South	Window	South	South	4.00	0
East	Window	East	East	3.20	0
North	Window	North	North	3.14	0
Door	Door	East	West	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	8.50	0.05	0.05	No
E3 Sill	Independently assessed	6.50	0.05	0.05	No
E4 Jamb	Independently assessed	22.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	22.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	22.00	0.07	0.07	No
P7 Party Wall - Exposed floor (normal)	Independently assessed	14.50	0.16	0.16	No
E16 Corner (normal)	Independently assessed	9.00	0.09	0.09	No
E18 Party wall between dwellings	Independently assessed	12.00	0.06	0.06	No

Y-value	0.08	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)

Summary for Input Data

elmhurst energy

Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	SAP table	
Description	Default ASHP	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Electricity	
SAP Code	224	
In Winter	219.30	
In Summer	190.40	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2210	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No

Summary for Input Data

Cold Water Source	From header tank
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store	None

32.0 Photovoltaic Unit	One Dwelling	
Export Capable Meter?	Yes	
Connected To Dwelling	Yes	
Diverter	No	
Battery Capacity [kWh]	0.00	

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.90	South	Horizontal	Modest	No	No	0.80		

34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	3-G-S ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	3-G-S ASHP + PV	**Prop Type Ref**	3-G-S Gas
Property			

SAP Rating	85 B	**DER**	4.22	**TER**	19.35
Environmental	97 A	**% DER < TER**			78.19
CO_2 Emissions (t/year)	0.2	**DFEE**	51.98	**TFEE**	59.75
Compliance Check	See BREL	**% DFEE < TFEE**			13.01
% DPER < TPER	54.11	**DPER**	47.17	**TPER**	102.78

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.3000	(1b)	x 3.0000	(2b) =	162.9000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		162.9000	(5)

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2. Ventilation rate

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		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	0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		1.5000	(17)
Infiltration rate		0.0750	(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) =	0.0694	(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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		86.4000 (23c)

Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			10.3400	0.8687	8.9826			(27)
Door			2.2000	1.1000	2.4200			(26)
Heatloss Floor 1			55.0000	0.1100	6.0500			(28b)
South	20.0000	4.0000	16.0000	0.1400	2.2400	110.0000	1760.0000	(29a)
North	18.0000	3.1400	14.8600	0.1400	2.0804	110.0000	1634.6000	(29a)
East	28.0000	5.4000	22.6000	0.1400	3.1640	110.0000	2486.0000	(29a)
Wall to Common	6.0000		6.0000	0.1100	0.6600	14.0000	84.0000	(29a)
Wall to Stores	42.0000		42.0000	0.1300	5.4600	110.0000	4620.0000	(29a)
External Roof 1	6.0000		6.0000	0.1100	0.6600	9.0000	54.0000	(30)
Total net area of external elements Aum(A, m2)			175.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.7170			(33)
Party Ceiling			48.0000			100.0000	4800.0000	(32b)
Internal Wall 1			54.0000			9.0000	486.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15924.6000	(34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 293.2707 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3	Sill	6.5000	0.0500	0.3250
E4	Jamb	22.0000	0.0500	1.1000
E20	Exposed floor (normal)	22.0000	0.3200	7.0400
E7	Party floor between dwellings (in blocks of flats)	22.0000	0.0700	1.5400
P7	Party Wall - Exposed floor (normal)	14.5000	0.1600	2.3200
E16	Corner (normal)	9.0000	0.0900	0.8100
E18	Party wall between dwellings	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.2800 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 45.9970 (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	8.4105	8.3172	8.2240	7.7578	7.6646	7.1984	7.1984	7.1052	7.3849	7.6646	7.8510	8.0375	(38)
Heat transfer coeff	54.4075	54.3142	54.2210	53.7548	53.6616	53.1954	53.1954	53.1022	53.3819	53.6616	53.8481	54.0345	(39)

Average = Sum(39)m / 12 = 53.7315

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0020	1.0003	0.9985	0.9900	0.9882	0.9797	0.9797	0.9779	0.9831	0.9882	0.9917	0.9951	(40)
HLP (average)												0.9895	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8168 (42)
Hot water usage for mixer showers

59.9626	59.0446	57.6917	55.6104	53.7457	51.1369	49.0736	51.4858	52.6990	55.2829	57.9737	59.9086	(42a)

Hot water usage for baths

23.1112	22.7623	22.2660	21.5227	20.8529	19.9307	19.2312	20.0866	20.5356	21.4493	22.3992	23.0928	(42b)

Hot water usage for other uses

33.2361	32.0275	30.8189	29.6103	28.4017	27.1931	27.1931	28.4017	29.6103	30.8189	32.0275	33.2361	(42c)

Average daily hot water use (litres/day) 106.9250 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	116.3099	113.8344	110.7766	106.7435	103.0003	98.2608	95.4979	99.9741	102.8449	107.5510	112.4004	116.2375	(44)
Energy conte	171.2282	150.6259	158.2974	139.4336	132.7263	113.6354	105.5280	117.6714	119.2949	138.5904	151.9129	170.7032	(45)
Energy content (annual)										Total = Sum(45)m =		1669.6475	
Distribution loss (46)m = 0.15 x (45)m	25.6842	22.5939	23.7446	20.9150	19.9089	17.0453	15.8292	17.6507	17.8942	20.7886	22.7869	25.6055	(46)

Water storage loss:
Store volume 150.0000 (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

224.6226	198.8531	211.6918	191.1056	186.1207	165.3074	158.9224	171.0658	170.9669	191.9848	203.5849	224.0976	(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

224.6226	198.8531	211.6918	191.1056	186.1207	165.3074	158.9224	171.0658	170.9669	191.9848	203.5849	224.0976	(64)
									Total per year (kWh/year) = Sum(64)m =		2298.3235	(64)
12Total per year (kWh/year)											2298	(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

99.6489	88.6649	95.3494	87.6993	86.8470	79.1214	77.8036	81.8412	81.0032	88.7968	91.8486	99.4743	(65)

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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	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	82.6947	91.5549	82.6947	85.4512	82.6947	85.4512	82.6947	82.6947	85.4512	82.6947	85.4512	82.6947	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	158.3798	160.0233	155.8818	147.0649	135.9353	125.4749	118.4868	116.8433	120.9848	129.8017	140.9314	151.3917	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	(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)	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	(71)
Water heating gains (Table 5)	133.9367	131.9418	128.1578	121.8046	116.7299	109.8908	104.5747	110.0017	112.5044	119.3506	127.5676	133.7021	(72)
Total internal gains	428.2635	436.7723	419.9866	407.5730	388.6121	371.0692	356.0085	359.7920	369.1928	385.0993	407.2024	421.0408	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.1400	10.6334	0.4000	0.7000	0.7700	6.4788	(74)
East	3.2000	19.6403	0.4000	0.7000	0.7700	12.1952	(76)
South	4.0000	46.7521	0.4000	0.7000	0.7700	36.2871	(78)

Solar gains	54.9610	95.6665	136.0287	176.6525	204.9040	206.4219	197.7715	176.2998	150.0686	107.1455	66.2109	46.7851	(83)
Total gains	483.2246	532.4388	556.0153	584.2255	593.5161	577.4911	553.7800	536.0918	519.2614	492.2448	473.4134	467.8259	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.3032	81.4427	81.5828	82.2903	82.4333	83.1556	83.1556	83.3017	82.8652	82.4333	82.1478	81.8643	
alpha	6.4202	6.4295	6.4389	6.4860	6.4956	6.5437	6.5437	6.5534	6.5243	6.4956	6.4765	6.4576	
util living area	0.9918	0.9835	0.9659	0.9081	0.7812	0.5818	0.4218	0.4542	0.6856	0.9144	0.9804	0.9932	(86)
MIT	20.2363	20.3758	20.5566	20.7864	20.9369	20.9920	20.9991	20.9986	20.9780	20.8075	20.4934	20.2109	(87)
Th 2	20.0817	20.0831	20.0845	20.0917	20.0931	20.1003	20.1003	20.1018	20.0974	20.0931	20.0903	20.0874	(88)
util rest of house	0.9889	0.9779	0.9543	0.8788	0.7240	0.5037	0.3361	0.3664	0.6062	0.8810	0.9727	0.9909	(89)
MIT 2	19.4044	19.5422	19.7179	19.9345	20.0562	20.0973	20.1001	20.1014	20.0879	19.9581	19.6644	19.3842	(90)
Living area fraction									fLA = Living area / (4) =			0.4273	(91)
MIT	19.7598	19.8984	20.0763	20.2985	20.4325	20.4796	20.4842	20.4848	20.4682	20.3210	20.0186	19.7374	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7598	19.8984	20.0763	20.2985	20.4325	20.4796	20.4842	20.4848	20.4682	20.3210	20.0186	19.7374	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9877	0.9765	0.9541	0.8861	0.7464	0.5371	0.3727	0.4040	0.6398	0.8903	0.9720	0.9897	(94)
Useful gains	477.2710	519.9296	530.5166	517.6986	442.9940	310.1475	206.4194	216.5664	332.2256	438.2688	460.1612	463.0194	(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	841.1310	814.6256	736.1195	612.7223	468.5989	312.7655	206.6240	216.9102	339.9457	521.6443	695.6428	839.5567	(97)
Space heating kWh	270.7119	198.0357	152.9686	68.4170	19.0500	0.0000	0.0000	0.0000	0.0000	62.0313	169.5468	280.1437	(98a)
Space heating requirement - total per year (kWh/year)												1220.9051	
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	270.7119	198.0357	152.9686	68.4170	19.0500	0.0000	0.0000	0.0000	0.0000	62.0313	169.5468	280.1437	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1220.9051	
Space heating per m2											(98c) / (4) =	22.4844	(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 %)												219.3000	(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	270.7119	198.0357	152.9686	68.4170	19.0500	0.0000	0.0000	0.0000	0.0000	62.0313	169.5468	280.1437	(98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)	123.4436	90.3036	69.7531	31.1979	8.6867	0.0000	0.0000	0.0000	0.0000	28.2861	77.3127	127.7445	(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	224.6226	198.8531	211.6918	191.1056	186.1207	165.3074	158.9224	171.0658	170.9669	191.9848	203.5849	224.0976	(64)
Efficiency of water heater												190.4000	(216)
(217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(217)
Fuel for water heating, kWh/month	117.9741	104.4396	111.1827	100.3706	97.7525	86.8211	83.4676	89.8455	89.7936	100.8323	106.9248	117.6983	(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	14.1785	12.8064	14.1785	13.7211	14.1785	13.7211	14.1785	14.1785	13.7211	14.1785	13.7211	14.1785	(231)
Lighting	15.9883	12.8264	11.5487	8.4611	6.5356	5.3396	5.9620	7.7496	10.0660	13.2071	14.9174	16.4326	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-9.5627	-16.6295	-29.7839	-40.0762	-48.1548	-46.5705	-45.5296	-40.1084	-30.9455	-20.9757	-11.3405	-7.8429	(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	-1.5794	-4.2724	-11.3563	-22.1318	-34.1256	-36.3735	-35.4653	-27.1730	-16.7473	-7.3082	-2.3453	-1.1566	(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												556.7283	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												190.4000	
Water heating fuel used												1207.1027	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)

mechanical ventilation fans (SFP = 0.8400)	166.9399	(230a)
Total electricity for the above, kWh/year	166.9399	(231)
Electricity for lighting (calculated in Appendix L)	129.0344	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-547.5548	(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	1512.2504	(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	556.7283	0.1566	87.1935	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1207.1027	0.1408	169.9520	(264)
Space and water heating			257.1455	(265)
Pumps, fans and electric keep-hot	166.9399	0.1387	23.1566	(267)
Energy for lighting	129.0344	0.1443	18.6236	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-347.5201	0.1313	-45.6169	
PV Unit electricity exported	-200.0347	0.1201	-24.0175	
Total			-69.6344	(269)
Total CO2, kg/year			229.2914	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.2200	(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	556.7283	1.5798	879.5308	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1207.1027	1.5206	1835.5161	(278)
Space and water heating			2715.0469	(279)
Pumps, fans and electric keep-hot	166.9399	1.5128	252.5467	(281)
Energy for lighting	129.0344	1.5338	197.9172	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-347.5201	1.4849	-516.0480	
PV Unit electricity exported	-200.0347	0.4404	-88.0990	
Total			-604.1470	(283)
Total Primary energy kWh/year			2561.3638	(286)
Dwelling Primary energy Rate (DPER)			47.1700	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	54.3000	(1b)	x 3.0000	(2b) =	162.9000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 54.3000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		162.9000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1228	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3728	(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) = 0.3448	(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													
	0.4396	0.4310	0.4224	0.3793	0.3707	0.3276	0.3276	0.3190	0.3448	0.3707	0.3879	0.4052	(22b)
Effective ac	0.5966	0.5929	0.5892	0.5719	0.5687	0.5537	0.5537	0.5509	0.5594	0.5687	0.5752	0.5821	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			10.3400	1.1450	11.8397			(27)
Heatloss Floor 1			55.0000	0.1300	7.1500			(28b)
South	20.0000	4.0000	16.0000	0.1800	2.8800			(29a)
North	18.0000	3.1400	14.8600	0.1800	2.6748			(29a)
East	28.0000	5.4000	22.6000	0.1800	4.0680			(29a)
Wall to Common	6.0000		6.0000	0.1800	1.0800			(29a)
Wall to Stores	42.0000		42.0000	0.1800	7.5600			(29a)
External Roof 1	6.0000		6.0000	0.1100	0.6600			(30)
Total net area of external elements Aum(A, m2)			175.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.1125			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	275.5912	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	8.5000	0.0500	0.4250
E3 Sill	6.5000	0.0500	0.3250
E4 Jamb	22.0000	0.0500	1.1000
E20 Exposed floor (normal)	22.0000	0.3200	7.0400
E7 Party floor between dwellings (in blocks of flats)	22.0000	0.0700	1.5400
P7 Party Wall - Exposed floor (normal)	14.5000	0.1600	2.3200
E16 Corner (normal)	9.0000	0.0900	0.8100
E18 Party wall between dwellings	12.0000	0.0600	0.7200

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.2800	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	54.3925	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	32.0737	31.8720	31.6742	30.7454	30.5717	29.7627	29.7627	29.6129	30.0743	30.5717	30.9232	31.2907	(38)
Heat transfer coeff	86.4662	86.2645	86.0667	85.1379	84.9642	84.1552	84.1552	84.0054	84.4668	84.9642	85.3157	85.6832	(39)
Average = Sum(39)m / 12 =												85.1371	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5924	1.5887	1.5850	1.5679	1.5647	1.5498	1.5498	1.5471	1.5556	1.5647	1.5712	1.5780	(40)
HLP (average)												1.5679	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8168	(42)
Hot water usage for mixer showers													
	54.6816	53.8599	52.6624	50.3713	48.6805	46.7949	45.7232	46.9116	48.2143	50.2388	52.5791	54.4721	(42a)
Hot water usage for baths													
	23.6381	23.2871	22.7927	21.8812	21.1986	20.4418	20.0330	20.5239	21.0584	21.8683	22.7986	23.5582	(42b)
Hot water usage for other uses													
	33.2361	32.0275	30.8189	29.6103	28.4017	27.1931	27.1931	28.4017	29.6103	30.8189	32.0275	33.2361	(42c)
Average daily hot water use (litres/day)												102.5455	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	111.5558	109.1744	106.2740	101.8628	98.2808	94.4299	92.9493	95.8372	98.8830	102.9260	107.4052	111.2664	(44)
Energy conte	176.6771	155.4629	163.3392	139.4450	132.3049	116.1126	112.4142	118.6665	121.9327	139.6695	153.0184	174.2163	(45)
Energy content (annual)										Total = Sum(45)m =		1703.2592	
Distribution loss (46)m = 0.15 x (45)m													
	26.5016	23.3194	24.5009	20.9168	19.8457	17.4169	16.8621	17.8000	18.2899	20.9504	22.9528	26.1324	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	223.2720	197.5486	209.9341	184.5369	178.8998	161.2044	159.0091	165.2614	167.0245	186.2644	198.1102	220.8112	(62)
WWHRS	-24.9982	-22.1086	-23.1508	-19.1698	-17.8656	-15.2877	-14.3298	-15.2383	-15.8172	-18.6468	-21.1245	-24.5352	(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													
	198.2739	175.4401	186.7833	165.3671	161.0343	145.9167	144.6793	150.0231	151.2073	167.6177	176.9857	196.2760	(64)
									Total per year (kWh/year) = Sum(64)m =			2019.6042	(64)
12Total per year (kWh/year)												2020	(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													
	96.0211	85.3600	91.5862	82.4389	81.2673	74.6809	74.6536	76.7325	76.6161	83.7160	86.9521	95.2028	(65)

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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	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	90.8410	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	80.9187	89.5886	80.9187	83.6160	80.9187	83.6160	80.9187	80.9187	83.6160	80.9187	83.6160	80.9187	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	158.3798	160.0233	155.8818	147.0649	135.9353	125.4749	118.4868	116.8433	120.9848	129.8017	140.9314	151.3917	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	32.0841	(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)													
	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	-72.6728	(71)
Water heating gains (Table 5)													
	129.0606	127.0238	123.0997	114.4985	109.2303	103.7235	100.3409	103.1351	106.4112	112.5216	120.7668	127.9608	(72)
Total internal gains													
	421.6114	429.8880	413.1525	398.4318	379.3365	363.0667	349.9987	351.1495	361.2644	376.4943	398.5664	413.5235	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	3.1400	10.6334	0.6300	0.7000	0.7700	10.2041	(74)
East	3.2000	19.6403	0.6300	0.7000	0.7700	19.2074	(76)
South	4.0000	46.7521	0.6300	0.7000	0.7700	57.1522	(78)

Solar gains	86.5636	150.6748	214.2452	278.2277	322.7238	325.1144	311.4901	277.6721	236.3581	168.7542	104.2822	73.6866	(83)
Total gains	508.1751	580.5628	627.3977	676.6595	702.0603	688.1811	661.4888	628.8216	597.6225	545.2485	502.8487	487.2101	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.0747	48.1871	48.2978	48.8247	48.9246	49.3948	49.3948	49.4829	49.2126	48.9246	48.7230	48.5140	
alpha	4.2050	4.2125	4.2199	4.2550	4.2616	4.2930	4.2930	4.2989	4.2808	4.2616	4.2482	4.2343	
util living area													
	0.9919	0.9851	0.9719	0.9355	0.8545	0.7009	0.5384	0.5829	0.8003	0.9469	0.9848	0.9932	(86)
MIT	19.4025	19.6106	19.9140	20.3224	20.6753	20.9037	20.9758	20.9660	20.8213	20.3729	19.8221	19.3722	(87)
Th 2	19.6189	19.6217	19.6243	19.6369	19.6393	19.6503	19.6503	19.6524	19.6461	19.6393	19.6345	19.6295	(88)
util rest of house													
	0.9890	0.9796	0.9610	0.9090	0.7934	0.5852	0.3840	0.4276	0.7013	0.9193	0.9781	0.9907	(89)
MIT 2	17.8261	18.0913	18.4744	18.9823	19.3819	19.6014	19.6444	19.6428	19.5379	19.0550	18.3707	17.7948	(90)
Living area fraction										fLA = Living area / (4) =		0.4273	(91)
MIT	18.4996	18.7405	19.0895	19.5549	19.9345	20.1579	20.2132	20.2082	20.0862	19.6181	18.9908	18.4687	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4996	18.7405	19.0895	19.5549	19.9345	20.1579	20.2132	20.2082	20.0862	19.6181	18.9908	18.4687	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9855	0.9748	0.9555	0.9071	0.8085	0.6320	0.4507	0.4947	0.7375	0.9188	0.9738	0.9877	(94)
Useful gains	500.8054	565.9148	599.4568	613.7951	567.6447	434.9249	298.1327	311.0580	440.7341	500.9679	489.6558	481.2036	(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													
	1227.7881	1193.9406	1083.5375	907.1335	699.6355	467.7233	304.0715	319.9064	505.6373	766.2138	1014.4746	1222.5898	(97)
Space heating kWh													
	540.8751	422.0333	360.1561	211.2036	98.2011	0.0000	0.0000	0.0000	0.0000	197.3429	377.8695	551.5913	(98a)
Space heating requirement - total per year (kWh/year)												2759.2730	
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													
	540.8751	422.0333	360.1561	211.2036	98.2011	0.0000	0.0000	0.0000	0.0000	197.3429	377.8695	551.5913	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2759.2730	
Space heating per m2											(98c) / (4) =	50.8153	(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													
	540.8751	422.0333	360.1561	211.2036	98.2011	0.0000	0.0000	0.0000	0.0000	197.3429	377.8695	551.5913	(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)													
	585.9968	457.2409	390.2016	228.8230	106.3934	0.0000	0.0000	0.0000	0.0000	213.8060	409.3927	597.6070	(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													
	198.2739	175.4401	186.7833	165.3671	161.0343	145.9167	144.6793	150.0231	151.2073	167.6177	176.9857	196.2760	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.1924	85.9535	85.5066	84.6095	82.9861	79.8000	79.8000	79.8000	79.8000	84.4269	85.7164	86.2471	(217)
Fuel for water heating, kWh/month													
	230.0364	204.1105	218.4430	195.4473	194.0497	182.8530	181.3024	187.9989	189.4828	198.5360	206.4782	227.5739	(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	16.8133	13.4883	12.1447	8.8977	6.8729	5.6152	6.2696	8.1495	10.5854	13.8886	15.6872	17.2806	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.6464	-27.2298	-40.5371	-47.2765	-52.4789	-49.5590	-48.9787	-45.5094	-39.6208	-31.9129	-20.8408	-16.0147	(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	-7.8556	-16.7721	-33.7885	-51.4052	-68.5982	-69.1287	-68.2892	-57.5119	-41.7674	-24.1731	-10.5510	-6.1918 (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	2989.4615	(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	2416.3120	(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)	135.6930	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-894.6378	(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	4732.8287	(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	2989.4615	0.2100	627.7869	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2416.3120	0.2100	507.4255	(264)
Space and water heating			1135.2124	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	135.6930	0.1443	19.5847	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-438.6052	0.1338	-58.6981	
PV Unit electricity exported	-456.0326	0.1255	-57.2456	
Total			-115.9437	(269)
Total CO2, kg/year			1050.7827	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			19.3500	(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	2989.4615	1.1300	3378.0915	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2416.3120	1.1300	2730.4326	(278)
Space and water heating			6108.5241	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	135.6930	1.5338	208.1305	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-438.6052	1.4946	-655.5246	
PV Unit electricity exported	-456.0326	0.4608	-210.1232	
Total			-865.6479	(283)
Total Primary energy kWh/year			5581.1075	(286)
Target Primary Energy Rate (TPER)			102.7800	(287)

Summary for Input Data

elmhurst energy

Property Reference	4-M-N ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	4-M-N ASHP + PV	**Prop Type Ref**	4-M-N Gas
Property			

SAP Rating	87 B	**DER**	3.08	**TER**	14.18
Environmental	98 A	**% DER < TER**			78.28
CO_2 Emissions (t/year)	0.2	**DFEE**	36.75	**TFEE**	42.64
Compliance Check	See BREL	**% DFEE < TFEE**			13.81
% DPER < TPER	53.78	**DPER**	34.58	**TPER**	74.80

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Mid-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	25.00 m	73.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	30.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	29.00	27.80	0.00	None	1.20	Enter Gross Area
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	29.00	21.00	0.00	None	8.00	Enter Gross Area
East	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	18.00	14.00	0.00	None	4.00	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	28.00	25.80	2.50	Stairwell Stairwell 2	2.20	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	10.00	0.00	None

Summary for Input Data

elmhurst energy

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	87.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling	Concrete floor slab, carpeted	100.00	73.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Exposed Floor - Solid	Lowest occupied	Other	0.11	Garage Single 1 Inside	0.70	0.00	23.00

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Concrete floor slab, carpeted	100.00	50.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
North	Window	North	North	1.20	0
East	Window	East	East	4.00	0
South	Window	South	South	8.00	0
Opening	Door	Wall to Common	North	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	9.30	0.05	0.05	No
E3 Sill	Independently assessed	7.30	0.05	0.05	No
E4 Jamb	Independently assessed	16.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	12.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	120.00	0.07	0.07	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	6.00	0.02	0.02	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Independently assessed	15.00	0.00	0.00	No

Y-value	0.11	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00
Wet Rooms	1

Summary for Input Data

elmhurst energy

SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	SAP table	
Description	Default ASHP	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Electricity	
SAP Code	224	
In Winter	219.30	
In Summer	190.40	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2210	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	

25.0 Main Heating 2	None
26.0 Heat Networks	None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No

Summary for Input Data

elmhurst energy

Water use <= 125 litres/person/day	Yes	
Summer Immersion	No	
Cold Water Source	From header tank	
Bath Count	1	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store	None	

32.0 Photovoltaic Unit	One Dwelling	
Export Capable Meter?	Yes	
Connected To Dwelling	Yes	
Diverter	No	
Battery Capacity [kWh]	0.00	

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.90	South	Horizontal	Modest	No	No	0.80		

34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	4-M-N ASHP + PV	Issued on Date	05/02/2024
Assessment Reference	4-M-N ASHP + PV	Prop Type Ref	4-M-N Gas
Property			

SAP Rating	87 B	DER	3.08	TER	14.18
Environmental	98 A	% DER < TER			78.28
CO_2 Emissions (t/year)	0.2	DFEE	36.75	TFEE	42.64
Compliance Check	See BREL	% DFEE < TFEE			13.81
% DPER < TPER	53.78	DPER	34.58	TPER	74.80

Assessor Details	Mr. Andrew Sturt	Assessor ID	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	73.0000	(1b)	x 3.0000	(2b) =	219.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		219.0000	(5)

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2. Ventilation rate

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	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	0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		1.5000	(17)
Infiltration rate		0.0750	(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) =	0.0694	(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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		86.4000 (23c)

Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			13.2000	0.8687	11.4672			(27)
Door			2.2000	1.1000	2.4200			(26)
Heatloss Floor 1			23.0000	0.1021	2.3491			(28b)
North	29.0000	1.2000	27.8000	0.1400	3.8920	110.0000	3058.0000	(29a)
South	29.0000	8.0000	21.0000	0.1400	2.9400	110.0000	2310.0000	(29a)
East	18.0000	4.0000	14.0000	0.1400	1.9600	110.0000	1540.0000	(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1100	2.8380	14.0000	361.2000	(29a)
Total net area of external elements Aum(A, m2)			127.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.8663			(33)
Party Wall 1			10.0000	0.0000	0.0000	70.0000	700.0000	(32)
Party Floor 1			50.0000			80.0000	4000.0000	(32d)
Party Ceiling			73.0000			100.0000	7300.0000	(32b)
Internal Wall 1			87.0000			9.0000	783.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	20052.2000 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 274.6877 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E2	Other lintels (including other steel lintels)	9.3000	0.0500	0.4650
E3	Sill	7.3000	0.0500	0.3650
E4	Jamb	16.0000	0.0500	0.8000
E20	Exposed floor (normal)	12.0000	0.3200	3.8400
E7	Party floor between dwellings (in blocks of flats)	120.0000	0.0700	8.4000
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	15.0000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9900 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.8563 (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	11.3069	11.1815	11.0562	10.4295	10.3041	9.6774	9.6774	9.5521	9.9281	10.3041	10.5548	10.8055	(38)
Heat transfer coeff	53.1632	53.0378	52.9125	52.2858	52.1604	51.5337	51.5337	51.4084	51.7844	52.1604	52.4111	52.6618	(39)
Average = Sum(39)m / 12 =												52.2544	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7283	0.7265	0.7248	0.7162	0.7145	0.7059	0.7059	0.7042	0.7094	0.7145	0.7180	0.7214	(40)
HLP (average)												0.7158	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3167 (42)
Hot water usage for mixer showers

69.1536	68.0948	66.5345	64.1343	61.9837	58.9751	56.5954	59.3774	60.7766	63.7565	66.8598	69.0912	(42a)

Hot water usage for baths

26.6351	26.2331	25.6611	24.8045	24.0325	22.9698	22.1635	23.1494	23.6668	24.7198	25.8146	26.6140	(42b)

Hot water usage for other uses

38.3553	36.9606	35.5658	34.1711	32.7764	31.3816	31.3816	32.7764	34.1711	35.5658	36.9606	38.3553	(42c)

Average daily hot water use (litres/day) 123.3198 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	134.1440	131.2885	127.7615	123.1098	118.7926	113.3265	110.1406	115.3032	118.6145	124.0422	129.6350	134.0605	(44)
Energy conte	197.4832	173.7212	182.5685	160.8122	153.0762	131.0583	121.7086	135.7139	137.5869	159.8409	175.2060	196.8777	(45)
Energy content (annual)										Total = Sum(45)m =		1925.6536	
Distribution loss (46)m = 0.15 x (45)m	29.6225	26.0582	27.3853	24.1218	22.9614	19.6587	18.2563	20.3571	20.6380	23.9761	26.2809	29.5317	(46)
Water storage loss:													
Store volume												150.0000	(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	250.8776	221.9484	235.9629	212.4842	206.4706	182.7303	175.1030	189.1083	189.2589	213.2353	226.8780	250.2721	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	250.8776	221.9484	235.9629	212.4842	206.4706	182.7303	175.1030	189.1083	189.2589	213.2353	226.8780	250.2721	(64)
										Total per year (kWh/year) = Sum(64)m =		2554.3296	(64)
12Total per year (kWh/year)												2554	(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	108.3787	96.3441	103.4195	94.8077	93.6134	84.9145	83.1836	87.8404	87.0852	95.8626	99.5936	108.1774	(65)

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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	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6896	119.2278	107.6896	111.2793	107.6896	111.2793	107.6896	107.6896	111.2793	107.6896	111.2793	107.6896	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.1952	206.3141	200.9745	189.6072	175.2580	161.7717	152.7621	150.6432	155.9828	167.3501	181.6993	195.1856	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	(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)	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	(71)
Water heating gains (Table 5)	145.6703	143.3691	139.0048	131.6773	125.8244	117.9368	111.8059	118.0651	120.9517	128.8476	138.3245	145.3997	(72)
Total internal gains	518.3056	529.6615	508.4194	493.3143	469.5225	448.7383	430.0082	434.1484	445.9643	464.6378	492.0536	509.0254	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2000	10.6334	0.4000	0.7000	0.7700	2.4760	(74)
East	4.0000	19.6403	0.4000	0.7000	0.7700	15.2440	(76)
South	8.0000	46.7521	0.4000	0.7000	0.7700	72.5742	(78)

Solar gains	90.2941	153.4099	208.5541	255.6580	283.4921	280.0864	270.6043	250.1089	224.9432	169.2162	108.0870	77.3108	(83)
Total gains	608.5997	683.0715	716.9735	748.9723	753.0146	728.8247	700.6125	684.2573	670.9075	633.8541	600.1406	586.3361	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	104.7728	105.0204	105.2692	106.5310	106.7870	108.0857	108.0857	108.3492	107.5624	106.7870	106.2762	105.7703	
alpha	7.9849	8.0014	8.0179	8.1021	8.1191	8.2057	8.2057	8.2233	8.1708	8.1191	8.0851	8.0514	
util living area	0.9840	0.9613	0.9168	0.8021	0.6376	0.4522	0.3236	0.3456	0.5311	0.8099	0.9556	0.9874	(86)
MIT	20.5762	20.7106	20.8387	20.9531	20.9927	20.9996	21.0000	21.0000	20.9986	20.9572	20.7722	20.5510	(87)
Th 2	20.3159	20.3174	20.3190	20.3265	20.3280	20.3356	20.3356	20.3371	20.3326	20.3280	20.3250	20.3220	(88)
util rest of house	0.9795	0.9513	0.8976	0.7680	0.5939	0.4054	0.2748	0.2958	0.4804	0.7703	0.9426	0.9837	(89)
MIT 2	19.9414	20.0712	20.1904	20.2939	20.3239	20.3354	20.3356	20.3371	20.3319	20.2999	20.1378	19.9222	(90)
Living area fraction										fLA = Living area / (4) =		0.4110	(91)
MIT	20.2023	20.3339	20.4568	20.5648	20.5988	20.6084	20.6086	20.6095	20.6059	20.5700	20.3985	20.1806	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2023	20.3339	20.4568	20.5648	20.5988	20.6084	20.6086	20.6095	20.6059	20.5700	20.3985	20.1806	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9786	0.9516	0.9018	0.7805	0.6117	0.4246	0.2948	0.3162	0.5013	0.7851	0.9442	0.9828	(94)
Useful gains	595.5621	650.0107	646.5615	584.5512	460.6172	309.4754	206.5727	216.3924	336.2997	497.6293	566.6639	576.2621	(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	845.4170	818.5817	738.4889	609.9030	464.1632	309.6340	206.5792	216.4038	336.9037	520.0389	696.9895	841.5685	(97)
Space heating kWh	185.8920	113.2797	68.3940	18.2532	2.6383	0.0000	0.0000	0.0000	0.0000	16.6728	93.8345	197.3880	(98a)
Space heating requirement - total per year (kWh/year)												696.3524	
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	185.8920	113.2797	68.3940	18.2532	2.6383	0.0000	0.0000	0.0000	0.0000	16.6728	93.8345	197.3880	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												696.3524	
Space heating per m2										(98c) / (4) =		9.5391	(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 %) 219.3000 (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	185.8920	113.2797	68.3940	18.2532	2.6383	0.0000	0.0000	0.0000	0.0000	16.6728	93.8345	197.3880	(98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)	84.7661	51.6551	31.1874	8.3234	1.2030	0.0000	0.0000	0.0000	0.0000	7.6027	42.7882	90.0082	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	250.8776	221.9484	235.9629	212.4842	206.4706	182.7303	175.1030	189.1083	189.2589	213.2353	226.8780	250.2721	(64)
Efficiency of water heater												190.4000	(216)
(217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(217)
Fuel for water heating, kWh/month	131.7634	116.5695	123.9301	111.5989	108.4405	95.9718	91.9659	99.3216	99.4007	111.9933	119.1586	131.4454	(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	19.0613	17.2166	19.0613	18.4464	19.0613	18.4464	19.0613	19.0613	18.4464	19.0613	18.4464	19.0613	(231)
Lighting	20.8208	16.7032	15.0394	11.0185	8.5110	6.9536	7.7640	10.0920	13.1085	17.1990	19.4263	21.3995	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-9.6190	-16.7663	-30.1813	-41.1563	-50.3647	-49.2109	-48.1004	-42.1242	-32.2484	-21.3679	-11.4269	-7.8834	(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	-1.5232	-4.1356	-10.9590	-21.0517	-31.9158	-33.7331	-32.8944	-25.1573	-15.4444	-6.9160	-2.2589	-1.1161	(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 1 317.5342 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 190.4000

Water heating fuel used 1341.5597 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)

mechanical ventilation fans (SFP = 0.8400) 224.4312 (230a)

Total electricity for the above, kWh/year	224.4312	(231)
Electricity for lighting (calculated in Appendix L)	168.0357	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-547.5548	(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	1504.0059	(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	317.5342	0.1586	50.3687	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1341.5597	0.1409	188.9880	(264)
Space and water heating			239.3568	(265)
Pumps, fans and electric keep-hot	224.4312	0.1387	31.1314	(267)
Energy for lighting	168.0357	0.1443	24.2527	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-360.4496	0.1310	-47.2149	
PV Unit electricity exported	-187.1052	0.1204	-22.5367	
Total			-69.7516	(269)
Total CO2, kg/year			224.9893	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0800	(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	317.5342	1.5872	503.9791	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1341.5597	1.5209	2040.3657	(278)
Space and water heating			2544.3448	(279)
Pumps, fans and electric keep-hot	224.4312	1.5128	339.5195	(281)
Energy for lighting	168.0357	1.5338	257.7387	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-360.4496	1.4839	-534.8732	
PV Unit electricity exported	-187.1052	0.4419	-82.6738	
Total			-617.5470	(283)
Total Primary energy kWh/year			2524.0560	(286)
Dwelling Primary energy Rate (DPER)			34.5800	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		73.0000 (1b)	x	3.0000 (2b)	=	219.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.1370	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3870	(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) =	0.3580	(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													

	0.4564	0.4475	0.4385	0.3938	0.3848	0.3401	0.3401	0.3311	0.3580	0.3848	0.4027	0.4206	(22b)
Effective ac	0.6042	0.6001	0.5961	0.5775	0.5740	0.5578	0.5578	0.5548	0.5641	0.5740	0.5811	0.5885	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			13.2000	1.1450	15.1145			(27)
Heatloss Floor 1			23.0000	0.1300	2.9900			(28b)
North	29.0000	1.2000	27.8000	0.1800	5.0040			(29a)
South	29.0000	8.0000	21.0000	0.1800	3.7800			(29a)
East	18.0000	4.0000	14.0000	0.1800	2.5200			(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1800	4.6440			(29a)
Total net area of external elements Aum(A, m2)			127.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.2525			(33)
Party Wall 1			10.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 254.6877 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	9.3000	0.0500	0.4650
E3 Sill	7.3000	0.0500	0.3650
E4 Jamb	16.0000	0.0500	0.8000
E20 Exposed floor (normal)	12.0000	0.3200	3.8400
E7 Party floor between dwellings (in blocks of flats)	120.0000	0.0700	8.4000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.0000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.9900 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 50.2425 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.6620	43.3697	43.0832	41.7376	41.4858	40.3138	40.3138	40.0967	40.7652	41.4858	41.9951	42.5276	(38)
Heat transfer coeff	93.9045	93.6122	93.3257	91.9801	91.7283	90.5563	90.5563	90.3392	91.0077	91.7283	92.2376	92.7701	(39)
Average = Sum(39)m / 12 =												91.9789	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2864	1.2824	1.2784	1.2600	1.2566	1.2405	1.2405	1.2375	1.2467	1.2566	1.2635	1.2708	(40)
HLP (average)												1.2600	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3167 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	63.0631	62.1154	60.7344	58.0921	56.1421	53.9675	52.7315	54.1021	55.6045	57.9393	60.6384	62.8215	(42a)
Hot water usage for baths	27.2424	26.8378	26.2681	25.2176	24.4310	23.5588	23.0876	23.6534	24.2694	25.2027	26.2748	27.1503	(42b)
Hot water usage for other uses	38.3553	36.9606	35.5658	34.1711	32.7764	31.3816	31.3816	32.7764	34.1711	35.5658	36.9606	38.3553	(42c)
Average daily hot water use (litres/day)												118.2686	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.6609	125.9138	122.5683	117.4808	113.3495	108.9079	107.2008	110.5318	114.0450	118.7078	123.8738	128.3271	(44)
Energy conte	203.7674	179.2996	188.3830	160.8253	152.5902	133.9150	129.6500	136.8615	140.6288	161.0854	176.4809	200.9293	(45)
Energy content (annual)										Total = Sum(45)m =		1964.4164	
Distribution loss (46)m = 0.15 x (45)m	30.5651	26.8949	28.2574	24.1238	22.8885	20.0873	19.4475	20.5292	21.0943	24.1628	26.4721	30.1394	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	250.3623	221.3853	234.9779	205.9171	199.1851	179.0068	176.2449	183.4564	185.7207	207.6803	221.5728	247.5242	(62)
WWHRS	-28.8298	-25.4973	-26.6993	-22.1081	-20.6040	-17.6310	-16.5262	-17.5740	-18.2417	-21.5049	-24.3625	-28.2959	(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	221.5324	195.8880	208.2785	183.8090	178.5811	161.3759	159.7187	165.8824	167.4790	186.1754	197.2103	219.2283	(64)
										Total per year (kWh/year) = Sum(64)m =		2245.1592	(64)
12Total per year (kWh/year)												2245	(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	105.0286	93.2857	99.9133	89.5479	88.0122	80.6002	80.3846	82.7824	82.8326	90.8368	94.7534	104.0849	(65)

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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	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	105.1165	116.3790	105.1165	108.6204	105.1165	108.6204	105.1165	105.1165	108.6204	105.1165	108.6204	105.1165	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.1952	206.3141	200.9745	189.6072	175.2580	161.7717	152.7621	150.6432	155.9828	167.3501	181.6993	195.1856	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	(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)													
	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	(71)
Water heating gains (Table 5)													
	141.1674	138.8180	134.2920	124.3721	118.2959	111.9447	108.0438	111.2666	115.0452	122.0925	131.6019	139.8991	(72)
Total internal gains													
	511.2296	522.2616	501.1335	483.3502	459.4209	440.0874	423.6729	424.7768	437.3989	455.3096	482.6721	500.9517	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2000	10.6334	0.6300	0.7000	0.7700	3.8996	(74)
East	4.0000	19.6403	0.6300	0.7000	0.7700	24.0093	(76)
South	8.0000	46.7521	0.6300	0.7000	0.7700	114.3043	(78)

Solar gains	142.2132	241.6207	328.4727	402.6613	446.5001	441.1361	426.2018	393.9215	354.2855	266.5156	170.2371	121.7644	(83)
Total gains	653.4429	763.8823	829.6063	886.0115	905.9210	881.2235	849.8747	818.6983	791.6844	721.8252	652.9092	622.7161	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.9974	55.1691	55.3384	56.1480	56.3021	57.0308	57.0308	57.1678	56.7479	56.3021	55.9912	55.6699	
alpha	4.6665	4.6779	4.6892	4.7432	4.7535	4.8021	4.8021	4.8112	4.7832	4.7535	4.7327	4.7113	
util living area													
	0.9901	0.9790	0.9584	0.9053	0.8005	0.6247	0.4622	0.4978	0.7198	0.9191	0.9794	0.9920	(86)
MIT	19.6988	19.9268	20.2106	20.5589	20.8184	20.9586	20.9920	20.9886	20.9174	20.5875	20.0887	19.6675	(87)
Th 2	19.8515	19.8547	19.8578	19.8723	19.8750	19.8877	19.8877	19.8901	19.8828	19.8750	19.8695	19.8638	(88)
util rest of house													
	0.9869	0.9724	0.9450	0.8750	0.7402	0.5297	0.3488	0.3827	0.6299	0.8865	0.9717	0.9894	(89)
MIT 2	18.3736	18.6628	19.0181	19.4463	19.7305	19.8657	19.8854	19.8865	19.8324	19.4909	18.8807	18.3426	(90)
Living area fraction									fLA = Living area / (4) =			0.4110	(91)
MIT	18.9182	19.1823	19.5082	19.9035	20.1776	20.3149	20.3402	20.3394	20.2783	19.9415	19.3772	18.8871	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9182	19.1823	19.5082	19.9035	20.1776	20.3149	20.3402	20.3394	20.2783	19.9415	19.3772	18.8871	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9833	0.9674	0.9400	0.8759	0.7578	0.5676	0.3956	0.4302	0.6637	0.8888	0.9674	0.9863	(94)
Useful gains	642.5613	738.9712	779.8373	776.0996	686.4801	500.1467	336.2278	352.2004	525.4756	641.5627	631.5946	614.1664	(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													
	1372.7141	1336.9950	1213.9991	1012.1040	777.6341	517.5167	338.6966	355.8840	562.2723	856.8818	1132.4157	1362.5216	(97)
Space heating kWh													
	543.2337	401.8720	323.0164	169.9232	67.8186	0.0000	0.0000	0.0000	0.0000	160.1974	360.5913	556.7763	(98a)
Space heating requirement - total per year (kWh/year)												2583.4288	
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													
	543.2337	401.8720	323.0164	169.9232	67.8186	0.0000	0.0000	0.0000	0.0000	160.1974	360.5913	556.7763	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2583.4288	
Space heating per m2											(98c) / (4) =	35.3894	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												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													
	543.2337	401.8720	323.0164	169.9232	67.8186	0.0000	0.0000	0.0000	0.0000	160.1974	360.5913	556.7763	(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)													
	588.5523	435.3976	349.9636	184.0988	73.4762	0.0000	0.0000	0.0000	0.0000	173.5616	390.6731	603.2246	(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													
	221.5324	195.8880	208.2785	183.8090	178.5811	161.3759	159.7187	165.8824	167.4790	186.1754	197.2103	219.2283	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9907	85.6350	85.0401	83.8840	82.0900	79.8000	79.8000	79.8000	79.8000	83.7246	85.3950	86.0580	(217)
Fuel for water heating, kWh/month													
	257.6238	228.7475	244.9179	219.1229	217.5432	202.2254	200.1488	207.8727	209.8735	222.3665	230.9390	254.7447	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.8411	17.5218	15.7764	11.5585	8.9281	7.2943	8.1445	10.5865	13.7509	18.0419	20.3783	22.4482	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.7884	-36.0506	-53.4389	-62.0272	-68.5673	-64.6141	-63.8240	-59.4246	-51.9411	-42.0895	-27.6422	-21.3042	(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	-10.8404	-23.1048	-46.4833	-70.6389	-94.2068	-94.9476	-93.8289	-79.0754	-57.4758	-33.3116	-14.5605	-8.5499	(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	2798.9478	(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	2696.1259	(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)	176.2705	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1202.7360	(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	4554.6082	(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	2798.9478	0.2100	587.7790	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2696.1259	0.2100	566.1864	(264)
Space and water heating			1153.9655	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	176.2705	0.1443	25.4413	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-575.7123	0.1339	-77.1068	
PV Unit electricity exported	-627.0237	0.1256	-78.7247	
Total			-155.8315	(269)
Total CO2, kg/year			1035.5045	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.1800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2798.9478	1.1300	3162.8110	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2696.1259	1.1300	3046.6222	(278)
Space and water heating			6209.4333	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	176.2705	1.5338	270.3695	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-575.7123	1.4950	-860.6647	
PV Unit electricity exported	-627.0237	0.4608	-288.9637	
Total			-1149.6284	(283)
Total Primary energy kWh/year			5460.2752	(286)
Target Primary Energy Rate (TPER)			74.8000	(287)

Summary for Input Data

elmhurst energy

Property Reference	4-T-N ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	4-T-N ASHP + PV	**Prop Type Ref**	4-T-N Gas
Property			

SAP Rating	84 B	**DER**	3.92	**TER**	16.51
Environmental	97 A	**% DER < TER**			76.26
CO_2 Emissions (t/year)	0.25	**DFEE**	48.34	**TFEE**	53.21
Compliance Check	See BREL	**% DFEE < TFEE**			9.15
% DPER < TPER	50.69	**DPER**	43.06	**TPER**	87.31

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Top-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	25.00 m	73.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	30.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	29.00	27.80	0.00	None	1.20	Enter Gross Area
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	29.00	21.00	0.00	None	8.00	Enter Gross Area
East	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	18.00	14.00	0.00	None	4.00	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	28.00	25.80	2.50	Stairwell Stairwell 2	2.20	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill	0.00	70.00	10.00	0.00	None

Summary for Input Data

elmhurst energy

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	87.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	73.00	73.00	None	0.00	Enter Gross Area	0.00

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Concrete floor slab, carpeted	100.00	73.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
North	Window	North	North	1.20	0
East	Window	East	East	4.00	0
South	Window	South	South	8.00	0
Opening	Door	Wall to Common	North	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	9.30	0.05	0.05	No
E3 Sill	Independently assessed	7.30	0.05	0.05	No
E4 Jamb	Independently assessed	16.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	12.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	60.00	0.07	0.07	No
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	Independently assessed	6.00	0.02	0.02	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Independently assessed	15.00	0.00	0.00	No
E15 Flat roof with parapet	Independently assessed	25.00	0.56	0.56	No

Y-value	0.13	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)

Summary for Input Data

elmhurst energy

Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	SAP table	
Description	Default ASHP	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Electricity	
SAP Code	224	
In Winter	219.30	
In Summer	190.40	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2210	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No

Summary for Input Data

Cold Water Source	From header tank
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store	None

32.0 Photovoltaic Unit	One Dwelling	
Export Capable Meter?	Yes	
Connected To Dwelling	Yes	
Diverter	No	
Battery Capacity [kWh]	0.00	

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.90	South	Horizontal	Modest	No	No	0.80		

34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	4-T-N ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	4-T-N ASHP + PV	**Prop Type Ref**	4-T-N Gas
Property			

SAP Rating	84 B	**DER**	3.92	**TER**	16.51
Environmental	97 A	**% DER < TER**			76.26
CO_2 Emissions (t/year)	0.25	**DFEE**	48.34	**TFEE**	53.21
Compliance Check	See BREL	**% DFEE < TFEE**			9.15
% DPER < TPER	50.69	**DPER**	43.06	**TPER**	87.31

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	73.0000	(1b)	x 3.0000	(2b) =	219.0000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		219.0000	(5)

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2. Ventilation rate

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		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	0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		1.5000	(17)
Infiltration rate		0.0750	(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) =	0.0694	(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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	86.4000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			13.2000	0.8687	11.4672			(27)
Door			2.2000	1.1000	2.4200			(26)
North	29.0000	1.2000	27.8000	0.1400	3.8920	110.0000	3058.0000	(29a)
South	29.0000	8.0000	21.0000	0.1400	2.9400	110.0000	2310.0000	(29a)
East	18.0000	4.0000	14.0000	0.1400	1.9600	110.0000	1540.0000	(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1100	2.8380	14.0000	361.2000	(29a)
External Roof 1	73.0000		73.0000	0.1100	8.0300	9.0000	657.0000	(30)
Total net area of external elements Aum(A, m2)			177.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.5472			(33)
Party Wall 1			10.0000	0.0000	0.0000	70.0000	700.0000	(32)
Party Floor 1			73.0000			80.0000	5840.0000	(32d)
Internal Wall 1			87.0000			9.0000	783.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 15249.2000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	208.8932	(35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	9.3000	0.0500	0.4650	
E3 Sill	7.3000	0.0500	0.3650	
E4 Jamb	16.0000	0.0500	0.8000	
E20 Exposed floor (normal)	12.0000	0.3200	3.8400	
E7 Party floor between dwellings (in blocks of flats)	60.0000	0.0700	4.2000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.0000	0.0000	0.0000	
E15 Flat roof with parapet	25.0000	0.5600	14.0000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 23.7900 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 57.3372 (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	11.3069	11.1815	11.0562	10.4295	10.3041	9.6774	9.6774	9.5521	9.9281	10.3041	10.5548	10.8055	(38)
Heat transfer coeff	68.6440	68.5187	68.3934	67.7666	67.6413	67.0146	67.0146	66.8892	67.2653	67.6413	67.8920	68.1427	(39)
Average = Sum(39)m / 12 =												67.7353	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9403	0.9386	0.9369	0.9283	0.9266	0.9180	0.9180	0.9163	0.9214	0.9266	0.9300	0.9335	(40)
HLP (average)												0.9279	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3167 (42)
Hot water usage for mixer showers

69.1536	68.0948	66.5345	64.1343	61.9837	58.9751	56.5954	59.3774	60.7766	63.7565	66.8598	69.0912	(42a)

Hot water usage for baths

26.6351	26.2331	25.6611	24.8045	24.0325	22.9698	22.1635	23.1494	23.6668	24.7198	25.8146	26.6140	(42b)

Hot water usage for other uses

38.3553	36.9606	35.5658	34.1711	32.7764	31.3816	31.3816	32.7764	34.1711	35.5658	36.9606	38.3553	(42c)

Average daily hot water use (litres/day) 123.3198 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	134.1440	131.2885	127.7615	123.1098	118.7926	113.3265	110.1406	115.3032	118.6145	124.0422	129.6350	134.0605	(44)
Energy conte	197.4832	173.7212	182.5685	160.8122	153.0762	131.0583	121.7086	135.7139	137.5869	159.8409	175.2060	196.8777	(45)
Energy content (annual)											Total = Sum(45)m =	1925.6536	
Distribution loss (46)m = 0.15 x (45)m	29.6225	26.0582	27.3853	24.1218	22.9614	19.6587	18.2563	20.3571	20.6380	23.9761	26.2809	29.5317	(46)

Water storage loss:
Store volume 150.0000 (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

250.8776	221.9484	235.9629	212.4842	206.4706	182.7303	175.1030	189.1083	189.2589	213.2353	226.8780	250.2721	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

250.8776	221.9484	235.9629	212.4842	206.4706	182.7303	175.1030	189.1083	189.2589	213.2353	226.8780	250.2721	(64)

Total per year (kWh/year) = Sum(64)m = 2554.3296 (64)
12Total per year (kWh/year) 2554 (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

108.3787	96.3441	103.4195	94.8077	93.6134	84.9145	83.1836	87.8404	87.0852	95.8626	99.5936	108.1774	(65)

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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	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.6896	119.2278	107.6896	111.2793	107.6896	111.2793	107.6896	107.6896	111.2793	107.6896	111.2793	107.6896	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.1952	206.3141	200.9745	189.6072	175.2580	161.7717	152.7621	150.6432	155.9828	167.3501	181.6993	195.1856	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	(69)
Pumps, fans 3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	(71)
Water heating gains (Table 5)	145.6703	143.3691	139.0048	131.6773	125.8244	117.9368	111.8059	118.0651	120.9517	128.8476	138.3245	145.3997	(72)
Total internal gains	518.3056	529.6615	508.4194	493.3143	469.5225	448.7383	430.0082	434.1484	445.9643	464.6378	492.0536	509.0254	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2000	10.6334	0.4000	0.7000	0.7700	2.4760	(74)
East	4.0000	19.6403	0.4000	0.7000	0.7700	15.2440	(76)
South	8.0000	46.7521	0.4000	0.7000	0.7700	72.5742	(78)

Solar gains	90.2941	153.4099	208.5541	255.6580	283.4921	280.0864	270.6043	250.1089	224.9432	169.2162	108.0870	77.3108	(83)
Total gains	608.5997	683.0715	716.9735	748.9723	753.0146	728.8247	700.6125	684.2573	670.9075	633.8541	600.1406	586.3361	(84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.7080	61.8209	61.9342	62.5070	62.6228	63.2085	63.2085	63.3269	62.9729	62.6228	62.3916	62.1621	
alpha	5.1139	5.1214	5.1289	5.1671	5.1749	5.2139	5.2139	5.2218	5.1982	5.1749	5.1594	5.1441	
util living area	0.9812	0.9655	0.9392	0.8733	0.7545	0.5726	0.4182	0.4458	0.6568	0.8784	0.9625	0.9841	(86)
MIT	20.0305	20.2165	20.4376	20.7063	20.8922	20.9795	20.9967	20.9953	20.9584	20.7402	20.3523	19.9962	(87)
Th 2	20.1334	20.1348	20.1363	20.1435	20.1450	20.1522	20.1522	20.1537	20.1493	20.1450	20.1421	20.1392	(88)
util rest of house	0.9766	0.9574	0.9250	0.8450	0.7050	0.5029	0.3390	0.3657	0.5879	0.8457	0.9523	0.9802	(89)
MIT 2	19.2640	19.4463	19.6603	19.9150	20.0735	20.1424	20.1512	20.1522	20.1272	19.9509	19.5866	19.2350	(90)
Living area fraction										fLA = Living area / (4) =		0.4110	(91)
MIT	19.5790	19.7628	19.9797	20.2402	20.4100	20.4864	20.4987	20.4987	20.4688	20.2753	19.9013	19.5478	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5790	19.7628	19.9797	20.2402	20.4100	20.4864	20.4987	20.4987	20.4688	20.2753	19.9013	19.5478	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9731	0.9534	0.9221	0.8484	0.7211	0.5309	0.3715	0.3986	0.6146	0.8511	0.9490	0.9770	(94)
Useful gains	592.2155	651.2193	661.1150	635.4513	543.0060	386.9370	260.3082	272.7677	412.3657	539.5030	569.5238	572.8236	(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	1048.8104	1018.3801	921.9247	768.4887	589.1543	394.4746	261.2670	274.1575	428.3995	654.4482	869.1043	1045.8425	(97)
Space heating kWh	339.7066	246.7320	194.0425	95.7869	34.3344	0.0000	0.0000	0.0000	0.0000	85.5192	215.6980	351.9261	(98a)
Space heating requirement - total per year (kWh/year)												1563.7457	
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	339.7066	246.7320	194.0425	95.7869	34.3344	0.0000	0.0000	0.0000	0.0000	85.5192	215.6980	351.9261	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1563.7457	
Space heating per m2										(98c) / (4) =		21.4212	(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 %) 219.3000 (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	339.7066	246.7320	194.0425	95.7869	34.3344	0.0000	0.0000	0.0000	0.0000	85.5192	215.6980	351.9261	(98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)	154.9050	112.5089	88.4826	43.6785	15.6563	0.0000	0.0000	0.0000	0.0000	38.9965	98.3575	160.4770	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	250.8776	221.9484	235.9629	212.4842	206.4706	182.7303	175.1030	189.1083	189.2589	213.2353	226.8780	250.2721	(64)
Efficiency of water heater												190.4000	(216)
(217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(217)
Fuel for water heating, kWh/month	131.7634	116.5695	123.9301	111.5989	108.4405	95.9718	91.9659	99.3216	99.4007	111.9933	119.1586	131.4454	(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	19.0613	17.2166	19.0613	18.4464	19.0613	18.4464	19.0613	19.0613	18.4464	19.0613	18.4464	19.0613	(231)
Lighting	20.8208	16.7032	15.0394	11.0185	8.5110	6.9536	7.7640	10.0920	13.1085	17.1990	19.4263	21.3995	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-9.7111	-17.0126	-30.7662	-41.9387	-50.8745	-49.2109	-48.1004	-42.1242	-32.2484	-21.6207	-11.5568	-7.9522	(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	-1.4310	-3.8893	-10.3740	-20.2693	-31.4059	-33.7331	-32.8944	-25.1573	-15.4444	-6.6632	-2.1290	-1.0473	(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 1 713.0623 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 190.4000

Water heating fuel used 1341.5597 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)

mechanical ventilation fans (SFP = 0.8400) 224.4312 (230a)

Total electricity for the above, kWh/year	224.4312	(231)
Electricity for lighting (calculated in Appendix L)	168.0357	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-547.5548	(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	1899.5341	(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	713.0623	0.1562	111.4147	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1341.5597	0.1409	188.9880	(264)
Space and water heating			300.4027	(265)
Pumps, fans and electric keep-hot	224.4312	0.1387	31.1314	(267)
Energy for lighting	168.0357	0.1443	24.2527	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-363.1166	0.1311	-47.6032	
PV Unit electricity exported	-184.4383	0.1199	-22.1136	
Total			-69.7168	(269)
Total CO2, kg/year			286.0701	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.9200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	713.0623	1.5784	1125.5311	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1341.5597	1.5209	2040.3657	(278)
Space and water heating			3165.8968	(279)
Pumps, fans and electric keep-hot	224.4312	1.5128	339.5195	(281)
Energy for lighting	168.0357	1.5338	257.7387	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-363.1166	1.4843	-538.9783	
PV Unit electricity exported	-184.4383	0.4398	-81.1117	
Total			-620.0900	(283)
Total Primary energy kWh/year			3143.0651	(286)
Dwelling Primary energy Rate (DPER)			43.0600	(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		73.0000 (1b)	x	3.0000 (2b)	=	219.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	219.0000	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(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) =	30.0000 / (5) =	0.1370	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3870	(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) =	0.3580	(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													

	0.4564	0.4475	0.4385	0.3938	0.3848	0.3401	0.3401	0.3311	0.3580	0.3848	0.4027	0.4206	(22b)
Effective ac	0.6042	0.6001	0.5961	0.5775	0.5740	0.5578	0.5578	0.5548	0.5641	0.5740	0.5811	0.5885	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			13.2000	1.1450	15.1145			(27)
North	29.0000	1.2000	27.8000	0.1800	5.0040			(29a)
South	29.0000	8.0000	21.0000	0.1800	3.7800			(29a)
East	18.0000	4.0000	14.0000	0.1800	2.5200			(29a)
Wall to Common	28.0000	2.2000	25.8000	0.1800	4.6440			(29a)
External Roof 1	73.0000		73.0000	0.1100	8.0300			(30)
Total net area of external elements Aum(A, m2)			177.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.2925			(33)
Party Wall 1			10.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 208.8932 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	9.3000	0.0500	0.4650
E3 Sill	7.3000	0.0500	0.3650
E4 Jamb	16.0000	0.0500	0.8000
E20 Exposed floor (normal)	12.0000	0.3200	3.8400
E7 Party floor between dwellings (in blocks of flats)	60.0000	0.0700	4.2000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.0000	0.0200	0.1200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	15.0000	0.0000	0.0000
E15 Flat roof with parapet	25.0000	0.5600	14.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 23.7900 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 65.0825 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	43.6620	43.3697	43.0832	41.7376	41.4858	40.3138	40.3138	40.0967	40.7652	41.4858	41.9951	42.5276	(38)
Heat transfer coeff	108.7445	108.4522	108.1657	106.8201	106.5683	105.3963	105.3963	105.1792	105.8477	106.5683	107.0776	107.6101	(39)
Average = Sum(39)m / 12 =												106.8189	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4897	1.4856	1.4817	1.4633	1.4598	1.4438	1.4438	1.4408	1.4500	1.4598	1.4668	1.4741	(40)
HLP (average)												1.4633	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3167 (42)

Hot water usage for mixer showers												
63.0631	62.1154	60.7344	58.0921	56.1421	53.9675	52.7315	54.1021	55.6045	57.9393	60.6384	62.8215	(42a)
Hot water usage for baths												
27.2424	26.8378	26.2681	25.2176	24.4310	23.5588	23.0876	23.6534	24.2694	25.2027	26.2748	27.1503	(42b)
Hot water usage for other uses												
38.3553	36.9606	35.5658	34.1711	32.7764	31.3816	31.3816	32.7764	34.1711	35.5658	36.9606	38.3553	(42c)
Average daily hot water use (litres/day)												118.2686	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	128.6609	125.9138	122.5683	117.4808	113.3495	108.9079	107.2008	110.5318	114.0450	118.7078	123.8738	128.3271	(44)
Energy conte	203.7674	179.2996	188.3830	160.8253	152.5902	133.9150	129.6500	136.8615	140.6288	161.0854	176.4809	200.9293	(45)
Energy content (annual)										Total = Sum(45)m =		1964.4164	
Distribution loss (46)m = 0.15 x (45)m													
	30.5651	26.8949	28.2574	24.1238	22.8885	20.0873	19.4475	20.5292	21.0943	24.1628	26.4721	30.1394	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	250.3623	221.3853	234.9779	205.9171	199.1851	179.0068	176.2449	183.4564	185.7207	207.6803	221.5728	247.5242	(62)
WWHRS	-28.8298	-25.4973	-26.6993	-22.1081	-20.6040	-17.6310	-16.5262	-17.5740	-18.2417	-21.5049	-24.3625	-28.2959	(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													
	221.5324	195.8880	208.2785	183.8090	178.5811	161.3759	159.7187	165.8824	167.4790	186.1754	197.2103	219.2283	(64)
										Total per year (kWh/year) = Sum(64)m =		2245.1592	(64)
12Total per year (kWh/year)												2245	(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													
	105.0286	93.2857	99.9133	89.5479	88.0122	80.6002	80.3846	82.7824	82.8326	90.8368	94.7534	104.0849	(65)

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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	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	115.8350	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	105.1165	116.3790	105.1165	108.6204	105.1165	108.6204	105.1165	105.1165	108.6204	105.1165	108.6204	105.1165	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	204.1952	206.3141	200.9745	189.6072	175.2580	161.7717	152.7621	150.6432	155.9828	167.3501	181.6993	195.1856	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	34.5835	(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)													
	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	-92.6680	(71)
Water heating gains (Table 5)													
	141.1674	138.8180	134.2920	124.3721	118.2959	111.9447	108.0438	111.2666	115.0452	122.0925	131.6019	139.8991	(72)
Total internal gains													
	511.2296	522.2616	501.1335	483.3502	459.4209	440.0874	423.6729	424.7768	437.3989	455.3096	482.6721	500.9517	(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	1.2000	10.6334	0.6300	0.7000	0.7700	3.8996	(74)
East	4.0000	19.6403	0.6300	0.7000	0.7700	24.0093	(76)
South	8.0000	46.7521	0.6300	0.7000	0.7700	114.3043	(78)

Solar gains	142.2132	241.6207	328.4727	402.6613	446.5001	441.1361	426.2018	393.9215	354.2855	266.5156	170.2371	121.7644	(83)
Total gains	653.4429	763.8823	829.6063	886.0115	905.9210	881.2235	849.8747	818.6983	791.6844	721.8252	652.9092	622.7161	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	38.9527	39.0576	39.1611	39.6544	39.7481	40.1901	40.1901	40.2730	40.0187	39.7481	39.5590	39.3633	
alpha	3.5968	3.6038	3.6107	3.6436	3.6499	3.6793	3.6793	3.6849	3.6679	3.6499	3.6373	3.6242	
util living area													
	0.9836	0.9708	0.9501	0.9039	0.8187	0.6714	0.5173	0.5529	0.7530	0.9156	0.9713	0.9861	(86)
MIT	19.1512	19.4158	19.7687	20.2213	20.6047	20.8682	20.9617	20.9505	20.7869	20.2908	19.6480	19.1131	(87)
Th 2	19.6953	19.6983	19.7012	19.7151	19.7178	19.7299	19.7299	19.7322	19.7252	19.7178	19.7125	19.7070	(88)
util rest of house													
	0.9790	0.9627	0.9358	0.8749	0.7614	0.5698	0.3808	0.4171	0.6629	0.8840	0.9620	0.9822	(89)
MIT 2	17.6037	17.9387	18.3816	18.9425	19.3828	19.6513	19.7171	19.7139	19.5814	19.0393	18.2451	17.5630	(90)
Living area fraction									fLA = Living area / (4) =			0.4110	(91)
MIT	18.2396	18.5457	18.9516	19.4680	19.8850	20.1514	20.2286	20.2221	20.0768	19.5536	18.8216	18.2000	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2396	18.5457	18.9516	19.4680	19.8850	20.1514	20.2286	20.2221	20.0768	19.5536	18.8216	18.2000	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9718	0.9531	0.9252	0.8682	0.7698	0.6060	0.4366	0.4722	0.6904	0.8790	0.9532	0.9757	(94)
Useful gains	635.0365	728.0847	767.5808	769.2468	697.4123	534.0036	371.0246	386.5679	546.6003	634.4930	622.3579	607.5994	(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													
	1515.8573	1479.9091	1346.8410	1128.8791	872.2602	585.0931	382.4386	402.0019	632.6307	954.1718	1255.1243	1506.5466	(97)
Space heating kWh													
	655.3306	505.2260	430.9696	258.9353	130.0868	0.0000	0.0000	0.0000	0.0000	237.8411	455.5918	668.8167	(98a)
Space heating requirement - total per year (kWh/year)												3342.7978	
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													
	655.3306	505.2260	430.9696	258.9353	130.0868	0.0000	0.0000	0.0000	0.0000	237.8411	455.5918	668.8167	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3342.7978	
Space heating per m2											(98c) / (4) =	45.7918	(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													
	655.3306	505.2260	430.9696	258.9353	130.0868	0.0000	0.0000	0.0000	0.0000	237.8411	455.5918	668.8167	(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)													
	710.0007	547.3738	466.9226	280.5366	140.9391	0.0000	0.0000	0.0000	0.0000	257.6826	493.5989	724.6118	(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													
	221.5324	195.8880	208.2785	183.8090	178.5811	161.3759	159.7187	165.8824	167.4790	186.1754	197.2103	219.2283	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3399	86.0873	85.6526	84.8281	83.3607	79.8000	79.8000	79.8000	79.8000	84.6101	85.8742	86.3946	(217)
Fuel for water heating, kWh/month													
	256.5818	227.5457	243.1667	216.6840	214.2270	202.2254	200.1488	207.8727	209.8735	220.0392	229.6503	253.7523	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.8411	17.5218	15.7764	11.5585	8.9281	7.2943	8.1445	10.5865	13.7509	18.0419	20.3783	22.4482	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.7884	-36.0506	-53.4389	-62.0272	-68.5673	-64.6141	-63.8240	-59.4246	-51.9411	-42.0895	-27.6422	-21.3042	(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	-10.8404	-23.1048	-46.4833	-70.6389	-94.2068	-93.8289	-79.0754	-57.4758	-33.3116	-14.5605	-8.5499		(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	3621.6660	(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	2681.7675	(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)	176.2705	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1202.7360	(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	5362.9680	(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	3621.6660	0.2100	760.5499	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2681.7675	0.2100	563.1712	(264)
Space and water heating			1323.7210	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	176.2705	0.1443	25.4413	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-575.7123	0.1339	-77.1068	
PV Unit electricity exported	-627.0237	0.1256	-78.7247	
Total			-155.8315	(269)
Total CO2, kg/year			1205.2601	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.5100	(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	3621.6660	1.1300	4092.4826	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2681.7675	1.1300	3030.3972	(278)
Space and water heating			7122.8799	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	176.2705	1.5338	270.3695	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-575.7123	1.4950	-860.6647	
PV Unit electricity exported	-627.0237	0.4608	-288.9637	
Total			-1149.6284	(283)
Total Primary energy kWh/year			6373.7218	(286)
Target Primary Energy Rate (TPER)			87.3100	(287)

Summary for Input Data

elmhurst energy

Property Reference	5-G-N ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	5-G-N ASHP + PV	**Prop Type Ref**	5-G-N Gas
Property			

SAP Rating	85 B	**DER**	3.91	**TER**	17.54
Environmental	97 A	**% DER < TER**			77.71
CO_2 Emissions (t/year)	0.2	**DFEE**	47.38	**TFEE**	53.00
Compliance Check	See BREL	**% DFEE < TFEE**			10.61
% DPER < TPER	53.04	**DPER**	43.69	**TPER**	93.04

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Urban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Ground-floor flat	
Which Floor	1	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	30.00 m	59.00 m²	3.00 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	26.00	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
North	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	20.00	18.80	0.00	None	1.20	Enter Gross Area
South	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	18.00	7.80	0.00	None	10.20	Enter Gross Area
East	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	5.00	5.00	0.00	None	0.00	Enter Gross Area
Wall to Common	Steel Frame	Steel frame wall (warm frame or hybrid construction)	0.16	14.00	6.00	6.00	2.50	Stairwell Stairwell 2	0.00	Enter Gross Area
Wall to Stores	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.14	110.00	42.00	42.00	0.70	Garage Single 1 Inside	0.00	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter

Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	23.00	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	63.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Roof 1	External Flat Roof	Plasterboard, insulated flat roof	0.11	9.00	10.00	10.00	None	0.00	Enter Gross Area	0.00

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling	Concrete floor slab, carpeted	100.00	49.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Exposed Floor - Solid	Lowest occupied	Other	0.11	None	0.00	0.00	55.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Window	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.40	Wood	0.70	0.90
Door	Manufacturer	Door to Corridor			Air Filled	0.00	Wood	0.70	1.10

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
North	Window	North	North	1.20	0
South	Window	South	South	8.00	0
Door	Door	South	South	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	7.00	0.05	0.05	No
E3 Sill	Independently assessed	3.00	0.05	0.05	No
E4 Jamb	Independently assessed	14.00	0.05	0.05	No
E20 Exposed floor (normal)	Independently assessed	30.00	0.32	0.32	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	30.00	0.07	0.07	No
P7 Party Wall - Exposed floor (normal)	Independently assessed	21.00	0.16	0.16	No
E16 Corner (normal)	Independently assessed	15.00	0.09	0.09	No
E18 Party wall between dwellings	Independently assessed	6.00	0.06	0.06	No

Y-value	0.12	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	1.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500480
Configuration	1
Manufacturer SFP	0.60
Duct Type	Rigid
MVHR Efficiency	96.00

Summary for Input Data

elmhurst energy

Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	100.00	9	900	12

24.0 Main Heating 1	SAP table	
Description	Default ASHP	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Electricity	
SAP Code	224	
In Winter	219.30	
In Summer	190.40	
Model Name	As SAP Reference Dwelling	
Manufacturer	As SAP Reference Dwelling	
Controls SAP Code	2210	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	

25.0 Main Heating 2	None

26.0 Heat Networks	None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No

Summary for Input Data

elmhurst energy

Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From header tank
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	9.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Insulation Thickness Type	50 mm	
Insulation Thickness	50	
Cylinder Volume	150.00	L
Loss	1.80	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
32.0 Photovoltaic Unit	One Dwelling	
Export Capable Meter?	Yes	
Connected To Dwelling	Yes	
Diverter	No	
Battery Capacity [kWh]	0.00	

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
0.90	South	Horizontal	Modest	No	No	0.80		

34.0 Small-scale Hydro	None
Electricity Generated	0.00
Apportioned	0.00 kWh/Year
Connected to dwelling's electricity meter	Yes
Electricity Generation	Annual

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	5-G-N ASHP + PV	**Issued on Date**	05/02/2024
Assessment Reference	5-G-N ASHP + PV	**Prop Type Ref**	5-G-N Gas
Property			

SAP Rating	85 B	**DER**	3.91	**TER**	17.54
Environmental	97 A	**% DER < TER**			77.71
CO_2 Emissions (t/year)	0.2	**DFEE**	47.38	**TFEE**	53.00
Compliance Check	See BREL	**% DFEE < TFEE**			10.61
% DPER < TPER	53.04	**DPER**	43.69	**TPER**	93.04

Assessor Details	Mr. Andrew Sturt	**Assessor ID**	CP77-0001
Client			

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	59.0000	(1b)	x 3.0000	(2b) =	177.0000	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.0000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		177.0000	(5)

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2. Ventilation rate

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	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	0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		1.5000	(17)
Infiltration rate		0.0750	(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) =	0.0694	(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	0.0885	0.0867	0.0850	0.0763	0.0746	0.0659	0.0659	0.0642	0.0694	0.0746	0.0780	0.0815	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	86.4000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.1565	0.1547	0.1530	0.1443	0.1426	0.1339	0.1339	0.1322	0.1374	0.1426	0.1460	0.1495	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			9.2000	0.8687	7.9923			(27)
Door			2.2000	1.1000	2.4200			(26)
Heatloss Floor 1			55.0000	0.1100	6.0500			(28b)
North	20.0000	1.2000	18.8000	0.1400	2.6320	110.0000	2068.0000	(29a)
South	18.0000	10.2000	7.8000	0.1400	1.0920	110.0000	858.0000	(29a)
East	5.0000		5.0000	0.1400	0.7000	110.0000	550.0000	(29a)
Wall to Common	6.0000		6.0000	0.1100	0.6600	14.0000	84.0000	(29a)
Wall to Stores	42.0000		42.0000	0.1300	5.4600	110.0000	4620.0000	(29a)
External Roof 1	10.0000		10.0000	0.1100	1.1000	9.0000	90.0000	(30)
Total net area of external elements Aum(A, m2)			156.0000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.1063			(33)
Party Wall 1			23.0000	0.0000	0.0000	110.0000	2530.0000	(32)
Party Ceiling			49.0000			100.0000	4900.0000	(32b)
Internal Wall 1			63.0000			9.0000	567.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16267.0000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		275.7119	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	7.0000	0.0500	0.3500
E3 Sill	3.0000	0.0500	0.1500
E4 Jamb	14.0000	0.0500	0.7000
E20 Exposed floor (normal)	30.0000	0.3200	9.6000
E7 Party floor between dwellings (in blocks of flats)	30.0000	0.0700	2.1000
P7 Party Wall - Exposed floor (normal)	21.0000	0.1600	3.3600
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	6.0000	0.0600	0.3600

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		17.9700	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	46.0763	(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	9.1384	9.0371	8.9358	8.4293	8.3280	7.8215	7.8215	7.7202	8.0241	8.3280	8.5306	8.7332	(38)
Heat transfer coeff	55.2147	55.1134	55.0121	54.5056	54.4043	53.8977	53.8977	53.7964	54.1004	54.4043	54.6069	54.8095	(39)
Average = Sum(39)m / 12 =												54.4802	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9358	0.9341	0.9324	0.9238	0.9221	0.9135	0.9135	0.9118	0.9170	0.9221	0.9255	0.9290	(40)
HLP (average)												0.9234	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9532	(42)
Hot water usage for mixer showers	62.4706	61.5141	60.1046	57.9363	55.9936	53.2757	51.1261	53.6391	54.9031	57.5951	60.3985	62.4142	(42a)
Hot water usage for baths	24.0728	23.7094	23.1924	22.4182	21.7205	20.7600	20.0313	20.9224	21.3900	22.3417	23.3312	24.0537	(42b)
Hot water usage for other uses	34.6330	33.3736	32.1142	30.8548	29.5954	28.3361	28.3361	29.5954	30.8548	32.1142	33.3736	34.6330	(42c)
Average daily hot water use (litres/day)												111.3987	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	121.1763	118.5971	115.4112	111.2094	107.3095	102.3718	99.4934	104.1570	107.1480	112.0510	117.1032	121.1008	(44)
Energy conte	178.3924	156.9279	164.9203	145.2672	138.2792	118.3896	109.9432	122.5947	124.2863	144.3890	158.2689	177.8455	(45)
Energy content (annual)										Total = Sum(45)m =		1739.5041	
Distribution loss (46)m = 0.15 x (45)m	26.7589	23.5392	24.7380	21.7901	20.7419	17.7584	16.4915	18.3892	18.6429	21.6584	23.7403	26.6768	(46)
Water storage loss:													
Store volume												150.0000	(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	231.7868	205.1551	218.3147	196.9392	191.6736	170.0616	163.3376	175.9891	175.9583	197.7834	209.9409	231.2399	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	231.7868	205.1551	218.3147	196.9392	191.6736	170.0616	163.3376	175.9891	175.9583	197.7834	209.9409	231.2399	(64)
									Total per year (kWh/year) = Sum(64)m =			2368.1801	(64)
12Total per year (kWh/year)												2368	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	102.0310	90.7603	97.5515	89.6390	88.6934	80.7021	79.2716	83.4782	82.6628	90.7249	93.9620	101.8491	(65)

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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	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	92.7357	102.6717	92.7357	95.8269	92.7357	95.8269	92.7357	92.7357	95.8269	92.7357	95.8269	92.7357	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	170.4180	172.1864	167.7301	158.2431	146.2675	135.0121	127.4928	125.7244	130.1807	139.6677	151.6433	162.8987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	(71)
Water heating gains (Table 5)	137.1384	135.0600	131.1176	124.4985	119.2115	112.0863	106.5479	112.2019	114.8094	121.9420	130.5028	136.8940	(72)
Total internal gains	455.5905	465.2165	446.8818	433.8669	413.5131	395.2237	379.0748	382.9604	393.1154	409.6438	433.2714	447.8268	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	1.2000	10.6334	0.4000	0.7000	0.7700	2.4760	(74)
South	8.0000	46.7521	0.4000	0.7000	0.7700	72.5742	(78)

Solar gains	75.0501	123.5895	159.4440	184.0339	195.7141	190.2300	185.0573	176.6253	167.8261	133.8317	89.0796	64.7748	(83)
Total gains	530.6407	588.8059	606.3259	617.9008	609.2272	585.4536	564.1321	559.5857	560.9415	543.4756	522.3510	512.6017	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.8371	81.9875	82.1385	82.9018	83.0562	83.8367	83.8367	83.9946	83.5228	83.0562	82.7480	82.4421	
alpha	6.4558	6.4658	6.4759	6.5268	6.5371	6.5891	6.5891	6.5996	6.5682	6.5371	6.5165	6.4961	
util living area	0.9878	0.9751	0.9534	0.8936	0.7750	0.5816	0.4196	0.4411	0.6494	0.8841	0.9709	0.9900	(86)
MIT	20.3064	20.4539	20.6170	20.8125	20.9409	20.9923	20.9992	20.9989	20.9842	20.8509	20.5602	20.2787	(87)
Th 2	20.1371	20.1386	20.1400	20.1473	20.1488	20.1560	20.1560	20.1575	20.1531	20.1488	20.1458	20.1429	(88)
util rest of house	0.9840	0.9676	0.9394	0.8637	0.7211	0.5085	0.3396	0.3610	0.5766	0.8470	0.9609	0.9868	(89)
MIT 2	19.5230	19.6676	19.8247	20.0087	20.1132	20.1529	20.1558	20.1572	20.1460	20.0453	19.7783	19.5007	(90)
Living area fraction									fLA = Living area / (4) =			0.4407	(91)
MIT	19.8682	20.0141	20.1738	20.3629	20.4780	20.5228	20.5275	20.5281	20.5154	20.4003	20.1228	19.8435	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8682	20.0141	20.1738	20.3629	20.4780	20.5228	20.5275	20.5281	20.5154	20.4003	20.1228	19.8435	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9825	0.9664	0.9400	0.8719	0.7428	0.5407	0.3749	0.3963	0.6084	0.8589	0.9606	0.9855	(94)
Useful gains	521.3667	569.0034	569.9652	538.7479	452.5610	316.5296	211.4756	221.7771	341.2702	466.7825	501.7545	505.1518	(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	859.5950	832.9906	752.2268	624.7919	477.5597	319.2254	211.6830	222.0780	347.0760	533.1803	711.1371	857.4145	(97)
Space heating kWh	251.6419	177.3994	135.6026	61.9517	18.5990	0.0000	0.0000	0.0000	0.0000	49.3999	150.7555	262.0835	(98a)
Space heating requirement - total per year (kWh/year)												1107.4335	
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	251.6419	177.3994	135.6026	61.9517	18.5990	0.0000	0.0000	0.0000	0.0000	49.3999	150.7555	262.0835	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1107.4335	
Space heating per m2											(98c) / (4) =	18.7701	(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 %)												219.3000	(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	251.6419	177.3994	135.6026	61.9517	18.5990	0.0000	0.0000	0.0000	0.0000	49.3999	150.7555	262.0835	(98)
Space heating efficiency (main heating system 1)	219.3000	219.3000	219.3000	219.3000	219.3000	0.0000	0.0000	0.0000	0.0000	219.3000	219.3000	219.3000	(210)
Space heating fuel (main heating system)	114.7478	80.8935	61.8343	28.2497	8.4811	0.0000	0.0000	0.0000	0.0000	22.5262	68.7439	119.5091	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	231.7868	205.1551	218.3147	196.9392	191.6736	170.0616	163.3376	175.9891	175.9583	197.7834	209.9409	231.2399	(64)
Efficiency of water heater												190.4000	(216)
(217)m	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	190.4000	(217)
Fuel for water heating, kWh/month	121.7368	107.7495	114.6611	103.4345	100.6689	89.3180	85.7865	92.4312	92.4151	103.8778	110.2631	121.4495	(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	15.4057	13.9148	15.4057	14.9087	15.4057	14.9087	15.4057	15.4057	14.9087	15.4057	14.9087	15.4057	(231)
Lighting	17.9296	14.3838	12.9510	9.4885	7.3292	5.9880	6.6859	8.6906	11.2882	14.8108	16.7287	18.4279	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-9.5816	-16.6733	-29.9260	-40.4682	-48.8708	-47.3418	-46.2817	-40.7020	-31.3328	-21.0883	-11.3675	-7.8568	(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	-1.5605	-4.2286	-11.2142	-21.7398	-33.4096	-35.6022	-34.7131	-26.5794	-16.3600	-7.1956	-2.3182	-1.1426	(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												504.9856	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												190.4000	
Water heating fuel used												1243.7921	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8400)

mechanical ventilation fans (SFP = 0.8400)	181.3896	(230a)
Total electricity for the above, kWh/year	181.3896	(231)
Electricity for lighting (calculated in Appendix L)	144.7021	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-547.5548	(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	1527.3146	(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	504.9856	0.1568	79.1906	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1243.7921	0.1408	175.1464	(264)
Space and water heating			254.3370	(265)
Pumps, fans and electric keep-hot	181.3896	0.1387	25.1610	(267)
Energy for lighting	144.7021	0.1443	20.8850	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-351.4909	0.1312	-46.1108	
PV Unit electricity exported	-196.0639	0.1201	-23.5566	
Total			-69.6674	(269)
Total CO2, kg/year			230.7155	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.9100	(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	504.9856	1.5805	798.1540	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1243.7921	1.5207	1891.4136	(278)
Space and water heating			2689.5675	(279)
Pumps, fans and electric keep-hot	181.3896	1.5128	274.4062	(281)
Energy for lighting	144.7021	1.5338	221.9489	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-351.4909	1.4847	-521.8413	
PV Unit electricity exported	-196.0639	0.4407	-86.4096	
Total			-608.2508	(283)
Total Primary energy kWh/year			2577.6717	(286)
Dwelling Primary energy Rate (DPER)			43.6900	(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	59.0000	(1b)	x 3.0000	(2b) =	177.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 59.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		177.0000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(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) =	20.0000 / (5) = 0.1130	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3630	(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) = 0.3358	(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													
	0.4281	0.4197	0.4113	0.3693	0.3610	0.3190	0.3190	0.3106	0.3358	0.3610	0.3777	0.3945	(22b)
Effective ac	0.5916	0.5881	0.5846	0.5682	0.5651	0.5509	0.5509	0.5482	0.5564	0.5651	0.5713	0.5778	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			9.2000	1.1450	10.5344			(27)
Heatloss Floor 1			55.0000	0.1300	7.1500			(28b)
North	20.0000	1.2000	18.8000	0.1800	3.3840			(29a)
South	18.0000	10.2000	7.8000	0.1800	1.4040			(29a)
East	5.0000		5.0000	0.1800	0.9000			(29a)
Wall to Common	6.0000		6.0000	0.1800	1.0800			(29a)
Wall to Stores	42.0000		42.0000	0.1800	7.5600			(29a)
External Roof 1	10.0000		10.0000	0.1100	1.1000			(30)
Total net area of external elements Aum(A, m2)			156.0000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.3124			(33)
Party Wall 1			23.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			259.1017 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	7.0000	0.0500	0.3500
E3 Sill	3.0000	0.0500	0.1500
E4 Jamb	14.0000	0.0500	0.7000
E20 Exposed floor (normal)	30.0000	0.3200	9.6000
E7 Party floor between dwellings (in blocks of flats)	30.0000	0.0700	2.1000
P7 Party Wall - Exposed floor (normal)	21.0000	0.1600	3.3600
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	6.0000	0.0600	0.3600
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			17.9700 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	53.2824 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	34.5576	34.3497	34.1460	33.1891	33.0100	32.1766	32.1766	32.0222	32.4976	33.0100	33.3722	33.7509	(38)
Heat transfer coeff	87.8399	87.6321	87.4283	86.4714	86.2924	85.4589	85.4589	85.3046	85.7800	86.2924	86.6546	87.0332	(39)
Average = Sum(39)m / 12 =												86.4706	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4888	1.4853	1.4818	1.4656	1.4626	1.4485	1.4485	1.4458	1.4539	1.4626	1.4687	1.4751	(40)
HLP (average)												1.4656	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9532	(42)
Hot water usage for mixer showers													
	56.9687	56.1126	54.8650	52.4781	50.7165	48.7521	47.6355	48.8736	50.2308	52.3400	54.7783	56.7504	(42a)
Hot water usage for baths													
	24.6216	24.2560	23.7410	22.7916	22.0807	21.2923	20.8665	21.3779	21.9346	22.7781	23.7471	24.5384	(42b)
Hot water usage for other uses													
	34.6330	33.3736	32.1142	30.8548	29.5954	28.3361	28.3361	29.5954	30.8548	32.1142	33.3736	34.6330	(42c)
Average daily hot water use (litres/day)												106.8359	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	116.2233	113.7421	110.7202	106.1245	102.3926	98.3805	96.8381	99.8470	103.0203	107.2324	111.8990	115.9218	(44)
Energy conte	184.0693	161.9672	170.1729	145.2791	137.8402	120.9703	117.1173	123.6314	127.0343	145.5133	159.4206	181.5055	(45)
Energy content (annual)										Total = Sum(45)m =		1774.5214	
Distribution loss (46)m = 0.15 x (45)m													
	27.6104	24.2951	25.5259	21.7919	20.6760	18.1455	17.5676	18.5447	19.0551	21.8270	23.9131	27.2258	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	230.6642	204.0530	216.7678	190.3709	184.4351	166.0622	163.7122	170.2263	172.1261	192.1082	204.5124	228.1004	(62)
WWHRS	-26.0437	-23.0333	-24.1191	-19.9716	-18.6128	-15.9271	-14.9291	-15.8756	-16.4788	-19.4267	-22.0081	-25.5614	(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													
	204.6205	181.0197	192.6487	170.3994	165.8223	150.1351	148.7831	154.3507	155.6473	172.6815	182.5044	202.5390	(64)
										Total per year (kWh/year) = Sum(64)m =		2081.1516	(64)
12Total per year (kWh/year)												2081	(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													
	98.4790	87.5227	93.8584	84.3788	83.1078	76.2961	76.2174	78.3834	78.3124	85.6591	89.0808	97.6265	(65)

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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	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	97.6612	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	90.1399	99.7977	90.1399	93.1445	90.1399	93.1445	90.1399	90.1399	93.1445	90.1399	93.1445	90.1399	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	170.4180	172.1864	167.7301	158.2431	146.2675	135.0121	127.4928	125.7244	130.1807	139.6677	151.6433	162.8987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	32.7661	(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)													
	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	-78.1289	(71)
Water heating gains (Table 5)													
	132.3642	130.2421	126.1538	117.1927	111.7040	105.9668	102.4428	105.3540	108.7672	115.1332	123.7234	131.2184	(72)
Total internal gains													
	448.2204	457.5246	439.3221	423.8787	403.4097	386.4218	372.3738	373.5166	384.3908	400.2391	423.8096	439.5554	(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	1.2000	10.6334	0.6300	0.7000	0.7700	3.8996	(74)
South	8.0000	46.7521	0.6300	0.7000	0.7700	114.3043	(78)

Solar gains	118.2040	194.6534	251.1244	289.8534	308.2497	299.6122	291.4653	278.1848	264.3261	210.7850	140.3003	102.0204	(83)
Total gains	566.4244	652.1780	690.4465	713.7321	711.6594	686.0340	663.8391	651.7014	648.7169	611.0241	564.1099	541.5757	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.3424	48.4570	48.5699	49.1074	49.2093	49.6892	49.6892	49.7791	49.5033	49.2093	49.0036	48.7904	
alpha	4.2228	4.2305	4.2380	4.2738	4.2806	4.3126	4.3126	4.3186	4.3002	4.2806	4.2669	4.2527	
util living area													
	0.9889	0.9791	0.9638	0.9285	0.8559	0.7103	0.5442	0.5734	0.7724	0.9291	0.9787	0.9907	(86)
MIT	19.4892	19.7124	19.9954	20.3584	20.6764	20.9000	20.9752	20.9686	20.8478	20.4482	19.9094	19.4543	(87)
Th 2	19.6959	19.6986	19.7012	19.7134	19.7157	19.7264	19.7264	19.7284	19.7223	19.7157	19.7110	19.7062	(88)
util rest of house													
	0.9851	0.9721	0.9512	0.9017	0.7989	0.6018	0.3977	0.4288	0.6762	0.8972	0.9703	0.9876	(89)
MIT 2	17.9975	18.2806	18.6364	19.0878	19.4513	19.6721	19.7195	19.7187	19.6284	19.2038	18.5410	17.9604	(90)
Living area fraction										fLA = Living area / (4) =		0.4407	(91)
MIT	18.6549	18.9116	19.2353	19.6477	19.9911	20.2132	20.2729	20.2695	20.1658	19.7522	19.1440	18.6187	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6549	18.9116	19.2353	19.6477	19.9911	20.2132	20.2729	20.2695	20.1658	19.7522	19.1440	18.6187	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9809	0.9665	0.9454	0.9001	0.8128	0.6464	0.4628	0.4929	0.7129	0.8983	0.9654	0.9839	(94)
Useful gains	555.6303	630.3455	652.7456	642.4249	578.4238	443.4389	307.2128	321.2163	462.4495	548.8910	544.5721	532.8340	(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													
	1260.9301	1227.8619	1113.4262	929.3730	715.4616	479.6984	313.8814	330.0863	520.3200	789.7622	1043.6667	1254.9081	(97)
Space heating kWh													
	524.7430	401.5310	342.7463	206.6026	101.9561	0.0000	0.0000	0.0000	0.0000	179.2081	359.3481	537.2231	(98a)
Space heating requirement - total per year (kWh/year)												2653.3585	
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													
	524.7430	401.5310	342.7463	206.6026	101.9561	0.0000	0.0000	0.0000	0.0000	179.2081	359.3481	537.2231	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2653.3585	
Space heating per m2											(98c) / (4) =	44.9722	(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													
	524.7430	401.5310	342.7463	206.6026	101.9561	0.0000	0.0000	0.0000	0.0000	179.2081	359.3481	537.2231	(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)													
	568.5190	435.0282	371.3395	223.8382	110.4617	0.0000	0.0000	0.0000	0.0000	194.1583	389.3262	582.0402	(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													
	204.6205	181.0197	192.6487	170.3994	165.8223	150.1351	148.7831	154.3507	155.6473	172.6815	182.5044	202.5390	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0765	85.7933	85.3369	84.4929	83.0030	79.8000	79.8000	79.8000	79.8000	84.1431	85.5502	86.1401	(217)
Fuel for water heating, kWh/month													
	237.7193	210.9951	225.7508	201.6730	199.7786	188.1392	186.4450	193.4219	195.0468	205.2237	213.3301	235.1273	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	18.7293	15.0253	13.5286	9.9117	7.6561	6.2551	6.9841	9.0782	11.7917	15.4713	17.4748	19.2498	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.2120	-29.4881	-43.8522	-51.0787	-56.6344	-53.4504	-52.8198	-49.1106	-42.8049	-34.5301	-22.5796	-17.3622	(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	-8.5838	-18.3224	-36.9068	-56.1445	-74.9228	-75.5104	-74.5983	-62.8277	-45.6279	-26.4105	-11.5295	-6.7665 (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	2874.7113	(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	2492.6507	(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)	151.1561	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-972.0743	(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	4632.4438	(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	2874.7113	0.2100	603.6894	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2492.6507	0.2100	523.4567	(264)
Space and water heating			1127.1460	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	151.1561	0.1443	21.8165	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9231	0.1339	-63.4373	
PV Unit electricity exported	-498.1512	0.1255	-62.5329	
Total			-125.9702	(269)
Total CO2, kg/year			1034.9216	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.5400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2874.7113	1.1300	3248.4237	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2492.6507	1.1300	2816.6953	(278)
Space and water heating			6065.1190	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	151.1561	1.5338	231.8482	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-473.9231	1.4947	-708.3570	
PV Unit electricity exported	-498.1512	0.4608	-229.5303	
Total			-937.8873	(283)
Total Primary energy kWh/year			5489.1807	(286)
Target Primary Energy Rate (TPER)			93.0400	(287)